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EDMUND RUFFIN, EDITOR AND PROPRIETOR.

CHOICE OF LANDS.

(Continued from page 233.)

From the South Western Farmer.

Poplar, which is common in our river counties, denotes land of the first class—none have stood cropping so long or retained their fertility so well among us as the poplar lands. We know of tracts which were opened in the old Spanish times, and have now been in regular cultivation, without rest or rotation, for more than half a century; and yet, where level enough to prevent the original surface from having been washed off, these lands seem scarcely diminished in fertility. The soil where poplar is the predominating growth is an unctuous, black mould, about a foot in depth, resting on a substratum of red clay. It has a sufficient quantity of sand with much lime in its composition, and is easily cultivated, and never bakes or becomes cloddy. These lands, however, notwithstanding their superiority for cotton and other crops, are said not to be so well adapted to corn and small grain—being inclined to force up too much stalk and leaf without a due proportion of seed. On the very best lands poplar will be the predominating growth. On that of a medium quality it will be seen mixed with other trees—beech, hickory, oak and even pine. Wherever seen however it denotes superiority, as it never grows on poor land. It never grows either in swamps or overflowed bottoms, and therefore indicates dry uplands. The tree is not difficult to deaden; and the timber is among the most valuable we have—making most superior lumber and working with great ease. The heart, or the black or yellow part of the tree however is the only valuable part. The sap is hard to be worked and soon rots. The heart is very lasting even in the ground.

Pine.—Of this we have only two varieties—the long leafed and the short leafed yellow pine. Land with little or no other growth but pine is the poorest sort; yet such is the effect of our climate that even such lands, which in other regions would be nearly entirely barren, here will bring tolerable crops of corn and small grain, and very superior crops of that great security against want in our poorest sections—the sweet potato. Scattering pines of large size will be occasionally seen on rich lands and heavy bottoms—but a small growth with no other trees intermixed denotes a soil as near sterility as any land among us ever approaches. Pine is deadened with difficulty, and unless fired scarcely ever dies completely the first year. The timber is of very unequal value. The long leaf is softer, drier and more lasting and altogether the most valuable. The short leaf is more watery, harder to work, and peculiarly liable to rot.

Persimon, we believe, indicates no particular character of soil. It is seen growing on poor and rich—on high and low alike.

Pecan, is a growth found chiefly in swamps, subject to overflow; though it is occasionally found on high and dry locations. In such places however it always has a stunted growth. In the swamps it is one of the largest of trees. The timber is valuable for rails and fire wood and is tolerably lasting. It has a texture between that of the hickory and the ash.

Pawpaw.—This graceful and beautiful shrub is seen only on rich spots. It will not grow on land deeply overflowed, though frequently seen in bottoms. It bears a rich and abundant fruit of a peculiar aromatic and luscious taste, but which is rejected, we believe, by all other animals except man.

Palmetto.—This is a plant seen rarely on high land. It grows most commonly on rich bottoms, not liable to deep and regular overflow; and yet not above it. Palmetto bottoms have been found to be extremely productive, and it is considered, next to cane, the best indication of good land in the swamps. Palmetto is very useful for making most durable and cheap roofs for cabins, and of the young leaves, which are white when they first appear, the cheap summer hats and bonnets so much in use are made.

Rushes, the singular, marine-looking stems without leaves—hollow and of a deep evergreen, which are seen so frequently in the bottoms of the Mississippi, indicate, like the palmetto, land of a medium elevation. Stock are extremely fond of it, and it is fast disappearing wherever they are becoming plentiful.

Sassafras denotes, when of large growth, rich land, generally above over-flow. The sprouts are continually shooting up with the persimon, on our thin lands—but they never attain any size, and in old fields, soon have to give place to oaks or pines. The timber is very easily worked, soft and easily split. It is peculiarly valuable for shingles, and is very lasting in any situation.

Sycamore denotes low-land, though it is not often seen in the swamp of the Mississippi. It is never seen on poor land. The timber is scarcely ever put to use among us.

Vines.—As a general rule, vines of a large size and plentiful denote superior land. In overflowed bottoms, the vines of all sorts become more tangled and thick, spreading out nearer the ground, and of a smaller and more spindling growth. The large grape vines, swinging from high branches, clear of the trunk of the trees, and free from the tangled branches near the ground, denote very superior land above over-flows. No vines of large size are ever found on poor ground.

Walnut, of large size and plentiful, denotes land of the first class. It never grows on either poor or overflowed land. The tree is easily deadened, and the timber is very valuable, and lasts extremely well in any situation. We here have only the black walnut. The white walnut or butternut is not seen in our latitude.

Willow, it is well known, grows only on low wet lands. The basket or golden willow is a sort which grows well in almost any situation, and is calculated to be of great value in the manufacture of cotton baskets.

We have thus gone over the most common growths among us, and endeavored to point out the qualities of soil they respectively indicate. In conclusion, we would say, if land in the interior is wished, make poplar and walnut the first trees to be sought for. If you cannot get land with those—look for ash—magnolia—sassafras, of large size—beech, or large sized white oaks. As a third choice, take land with large red oaks and hickories. If you want a dry sandy soil, look for scrubby black jacks and hickories—if a tenacious wet one, look for post oaks or willow oak. If you go among pine, take first the land which has large trees, scattering and intermixed with other growth—and leave as the last chance such spots as grow no other tree, particularly if they are small. If you go into the swamp—look first of all for what are called the cane prairies—spots covered with cane of a large growth, with the timber so scattering as to look almost as if it had been cleared. The only rule of choice in our swamps is generally the elevation of the ground and its freedom from over-flow. All our swamp land nearly is rich alike—and where free from over-flow, is exceedingly productive. A stiff cane brake of large high cane, is one of the best marks of high land, and those cane prairies are nearly infallible. Look too for those kinds of trees which we have specified as growing only on high land; and avoid trees that have a great inequality between the size, a little above the roots, and the size of the main stem—such as spring from the ground as if they would make a large tree, but fall off at a few feet in height, to perhaps less than half the size of the but. Avoid too, on the other hand, trees which have *no* falling off from their size at the ground—such as appear like immense piles *driven* down into the earth. That appearance is given to them by the settling of the dirt around them, caused by frequent over-flows. The roots of such trees may be many feet below the surface. See that the roots are to be traced plainly on the surface without being covered in this way. Look too to see if the leaves which have fallen annually, have accumulated and lie evenly on the surface, without being washed off or lodged against trees and bushes, by the currents of an over-flow. Avoid such lands as have the appearance of numerous hog-beds—little hills and hollows over the surface. This is occasioned by currents, which in over-flow drift the earth into these inequalities.

We firmly believe, however, that the time is not a century off, when every foot of the immense bottoms of the Mississippi will be redeemed to cultivation, and be found valuable.

MODEL FARMS IN FRANCE.

By Martin Doyle.

(From "A Cyclopædia of Practical Husbandry and Rural Affairs in general.")

There are in France three large model farms, supported chiefly by contributions from individuals, or by the zeal and liberality of a single person, as in the instance of the school at Doville, near Nancy, of which that eminent farmer, M. Dombasle, is the founder and director. Grignon (founded in 1827) is the chief, having 1,100 acres of varied soil in connexion with it. Grignon is one of the royal demesnes, and the present king, anxious to promote the interests of agriculture, gave the buildings and land for forty years to the society which had been formed of many of the nobility and great proprietors, by whom the sum of 600,000 francs was funded as a capital, in shares of 1,200 francs each. The only condition on the part of the crown is, that at the expiration of the term the improvements shall be the property of the crown. At this great seminary there are two classes of pupils, as at Hohenheim. We are informed by John Evelyn Denison, esq., that the best implements from England and Germany are put to trial at Grignon, and that the best systems of husbandry are followed, under the guidance of an able professor; theory and practice going hand in hand.

The internal pupils pay from 30*l.* to 60*l.* a year each, and the external from 8*l.* to 20*l.* Diplomas are granted after a public examination, and the shortest course occupies two years. The same gentleman has informed the public that the three chief veterinary schools at Alfort, Toulouse, and Lyons, afford a course of education which lasts four years. Botany and chemistry, as well as anatomy, are taught in those establishments, in which there are a great number of pupils, who are lodged, boarded, and instructed, for 14*l.* a year; and as it is intended that they should be instructed in the points of useful practice relating to agriculture, in order to be as serviceable as possible in the farming districts, an establishment of bulls and cows, sheep, pigs, and dogs, is kept up, in order to illustrate the diseases of these animals, and invalided horses are taken in at a moderate rate and treated in the hospital.

"The departmental model farms, of which there are several, and many of them insignificant, are differently managed. They are principally supported at the expense of the department in which they are established, after previous approval by the prefect. We have inspected one of these useful and inexpensive schools, near Rennes, and ascertained precisely the details of its establishment and operation. The farm consists of seventy-two acres of arable land, held by lease of fifteen years from a wealthy proprietor, by M. Bodin, who was assisted by the principal authorities of the department of Ile et Vilaine to take the direction of it. M. Bodin had been a pupil at Grignon, and subsequently managed a small farm in a similar capacity, before he obtained the present one, which was in 1837. The rent of the farm, is 3,500 francs (140*l.*), of which the department pays 2,000 francs, and the director the remainder, with taxes and repairs, which amount to about 500 francs more. He also supplies all capital for improvements, and all outgoings, clears all losses, and of course has all the profits.

There are in this school twenty pupils, paying 12*l.* a year each; the department in which the school is situated pays for six, and the government pays for the remaining fourteen, who are nominated by the prefects of three other departments in Brittany. In case of dismissals for misconduct, the prefects nominate other pupils, and they are unwilling to select youths from the towns, or any not accustomed to field labor; they are generally the sons of well-conducted farmers, and

at the expiration of two years go to the aid of their parents, or as hired stewards.

They are taught by M. Bodin, or an assistant, the ordinary subjects suited to their employment, and have no charge except for books, which they must supply for themselves.

M. Bodin has a factory for implements, and disposes of many of them to farmers, even in very distant localities; he is altogether well qualified for his important office, and has obtained a prize for a Treatise on Agriculture, which is now about to be enlarged in a second edition. And when practical men are induced, with moderate assistance, to take the *responsibilities* of a model farm upon themselves, and to receive pupils for three or more years at a reasonable rate of payment, they are the most eligible class of instructers.

INDIAN OR FIELD PEAS.

From the South-Western Farmer.

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In a wet season, one of the greatest difficulties the cotton grower has to contend with in old and rich soils, is the spontaneous and rapid growth of crab grass. This is not only a serious evil to the growing crop, but it extends its malign presence and influence to, and during the picking season; rendering it infinitely more unpleasant and unhealthy to the hands, by the heavy dews it retains, until a late hour of the day. "An ounce of prevention is worth a pound of cure." Now, although I do not know how this *mathematical* axiom was first introduced, or on what data the calculation was made, to arrive at such a rational conclusion, I have as much faith in the assumption, as that "a stitch in time will save nine;" which I *know* to be demonstrable according to "Pike," "Gough," and others of ancient reverence, and if it cannot be proved by those of the present degenerate age, why, I would not give a fig for the whole of them. Now, Messrs., for fear you will be getting tired by such irrelevant matter, I will endeavor to approximate as near as I can to what I *do* want to say.

You must know then that I have great faith in a pea crop, and in my limited experience, I have, I think, arrived at one fact, which by being pursued in the way of rotation, as it should be, I have no doubt will lessen the cotton planter's labor in working his crop at least fifty per cent. Now, it is not my intention to inflict on you and your readers a long article, but if this is well received, no one may know, for the future, what you may have to suffer. I write this article *now*, that *all* may have time to profit by it for the cotton crop of next year.

Do not sow your peas in your corn field—it is a bad plan. Sow them in your rye or oat stubble as soon after you get your crop off the ground as possible—*with at least three pecks to an acre of the greatest running peas, or one bushel or more if of the black or others that run but little.* I prefer sowing them in drills about 2 to 2½ feet apart, dropping two or three peas in a place, when the vines are to be gathered; which should be done before the frost catches them. Sown broadcast when to be fed on the ground, is fully as good a plan. The best method of curing them is to let them get somewhat wilted, not particular how much, so that the leaves are not dried enough to drop off; then throw them into moderate sized cocks in the field, and let them stand until sufficiently cured, which will require several days—even if the weather should be fine—but be not alarmed at rain falling on them. There can be no superior food for stock in any country, and is withal a cheap one. When to be stacked away, the most approved method is to mix alternate layers of dry straw of some description, and a liberal use of salt will not be amiss. This renders the otherwise useless straw, nearly as valuable as the pea fodder, and *ensures the keeping of the latter.*

But this is all digression, I only wanted to say, that I sowed last year in a very grassy piece of ground about three pecks of the "Crowder" peas to the acre, and that this year there is not a spear of crab grass to be seen. They completely matted the ground, and have smothered out every vestige of the grass. No land could have been in finer condition for a cotton crop this spring in consequence. The pea crop was worth to *me* at the rate of at least $20 per acre, estimating corn to be worth 50 cents per bushel. I do not think that the pea is proportionate to the increased quantity of vine, but the hay that can be made from them vastly counterbalances any deficiency in that respect. The objection may be made that no one would want to sow as many peas as would prepare his entire cotton ground; if so, sow all you can. But I wonder if it would not be better to plant less cotton and more peas, and feed and keep well more good cows, horses, mules and oxen. * * * *

MINERAL BONE EARTH.

From the British American Farmer.

Mr. Pusey, M. P., reported to the Council of the Royal English Agricultural Society, as chairman of the geological committee, the result of Professor Phillips' examination of the specimens of native phosphate of lime from Estramadura, in Spain, presented to the society by Mr. Kemberley at a former meeting of the council, and referred to the geological committee for their opinion of its value in an agricultural point of view, as a substitute to a certain extent, and as far as the phosphate of lime was concerned, for bone-dust as a manure.

Mr. Phillips found that this specimen contained no less than 90 per cent. of the phosphate, and he was therefore of opinion that it would be a most important manuring application, provided its mechanical texture could be modified in such manner as to assimilate it to that of the phosphate existing in bone-dust. Mr. Pusey reported that Professor Phillips' investigation on this point had led to a successful result, and that he had discovered a mode by which this valuable mineral substance could be brought into a fit state for application as a manure; but he considered that it would be important that a full examination of this substance should be instituted, previous to any steps being taken to import it as an article of commerce.

Dr. Daubeny is about to undertake a journey

into Spain, at his own expense, for the purpose of inspecting the geological occurrence of this mineral in that country.

GEOMETERS, CANKER-WORMS, PLANT LICE.

(From Harris's Report on the Insects of Massachusetts.)

The caterpillars of the *Geometræ* of Linnæus, earth-measurers, as the term implies, or geometers, span-worms, and loopers, have received these several names from their peculiar manner of moving, in which they seem to measure or span over the ground, step by step, as they proceed. Most of these caterpillars have only ten legs; namely, six, which are jointed and tapering under the fore part of the body, and four fleshy proplegs, at the hinder extremity; the three intermediate pairs of proplegs being wanting. Consequently, in creeping, they arch up the back while they bring forward the hinder part of the body, and then resting on their hind legs, stretch out to their full length, in a straight line, before taking another step with their hind legs. Some of the geometers have twelve or fourteen legs; but the additional proplegs are so short that the caterpillars cannot use them in creeping, and their motions are the same as those that have only ten legs. Some caterpillars with fourteen legs, and wanting only the terminal pair of proplegs, are placed in this tribe on account of the resemblance of their moths, to those of the true geometers. The latter live on trees and bushes, and most of them undergo their transformations upon or in the ground, to reach which, by travelling along the branches and down the stem, would be a long and tedious journey to them, on account of the deficiency of their legs, and the slowness of their gait. But they are not reduced to this necessity; for they have the power of letting themselves down from any height, by means of a silken thread, which they spin from their mouths while falling. Whenever they are disturbed, they make use of this faculty, drop suddenly, and hang suspended, till the danger is past, after which they climb up again by the same thread. In order to do this, the span-worm bends back its head and catches hold of the thread above its head with one of the legs of the third segment, then raising its head it seizes the thread with its jaws and fore legs, and, by repeating the same operations with tolerable rapidity, it soon reaches its former station on the tree. These span-worms are naked, or only thinly covered with very short down; they are mostly smooth, but sometimes have warts or irregular projections on their backs. They change their color usually as they grow older, and sometimes of one uniform color, nearly resembling the bark of the plants on which they are found. When not eating, many of them rest on the two hindmost pairs of legs against the side of a branch, with the body extended from the branch, so that they might be mistaken for a twig of the tree; and in this position they will often remain for hours together. When about to transform, most of these insects descend from the plants on which they live, and either bury themselves in the ground, or conceal themselves on the surface, under a slight covering of leaves fastened together with silken threads. Some make more regular cocoons, which, however, are very thin, and generally more or less covered on the outside with leaves. The cocoons of the European-tailed geometer (*Ourapteryx sambucaria,*) which lives on the elder, and of our chain-dotted geometer (*Geometra catenaria,*) which is found on the wood-wax, are made with regular meshes, like net-work, through which the insects may be seen. A very few of the span-worms fasten themselves to the stems of plants, and are changed to chrysalids, which hang suspended, without the protection of any outer covering.

In their perfected state, these insects are mostly slender-bodied moths, with tapering antennæ, which are often feathered in the males. Their feelers are short and slender; the tongue is short and weak; the thorax is not crested; the wings are large, thin, and delicate—sometimes angular, and often marked with one or two dark-colored oblique bands. They generally rest with the wings slightly inclined and almost horizontal; some with them extended, and others with the hind wings covered by the upper pair. A very few carry their wings like the skippers. Some of the females are without wings, and are distinguished also by the oval and robust form of their bodies. These moths are most active in the night; but some of them may be seen flying in thickets during the day time. They are very short-lived, and die soon after their eggs are laid.

Those kinds whereof the females are wingless, or have only very short, scale-like wings and naked antennæ, while the males have large, entire wings, and feathers or downy antennæ, seem to form a distinct group, which may be named hybernians (*Hybernidæ,*) from the principal genus included therein. The caterpillars have only ten legs, six before and four behind; and they undergo their transformations in the ground. The insects called canker-worms, in this country, are of this kind. The moths, from which they are produced, belong to the genus *Anisopteryx*, (literally unequal wing,) so named because in some species the wings in the two sexes are very unequal in size, and in others the females are wingless. In the late Professor Peck's "Natural History of the Canker-worm," which was published among the papers of the Massachusetts Society for promoting Agriculture, and obtained a prize from the society, this insect is called *Phalæna vernata*, on account of its common appearance in the spring, and also to distinguish it from the winter moth (*Phalæna* or *Cheimatobia brumata*) of Europe. In the male canker-worm moth the antennæ have a very narrow, and almost downy edging, on each side, hardly to be seen with the naked eye. The feelers are minute, and do not extend beyond the mouth. The tongue is not visible. The wings are large, very thin and silky; and, when the insect is at rest, the fore wings are turned back, entirely cover the hind wings, and overlap on their inner edges. The fore wings are ash-colored, with a distinct whitish spot on the front edge, near the tip; they are crossed by two jagged, whitish bands, along the sides of which there are several blackish dots; the outermost band has an angle near the front edge, within which there is a short, faint, blackish line; and there is a row of black dots along the outer margin, close to the fringe. The hind wings are pale ash-colored, with a faint blackish dot near the middle. The wings expand about

one inch and a quarter. This is the usual appearance of the male, in its most perfect condition; by which it will be seen that it closely resembles the *Anisopteryx æscularia* of Europe. Compared with the latter, I find that our canker-worm moth is rather smaller, the wings are darker, proportionally shorter and more obtuse, the white bands are less distinct, and are often entirely wanting, in which case only the whitish spot near the tip remains, the hind wings are more dusky, and the feelers are gray instead of being white. Specimens, of a rather smaller size, are sometimes found, resembling the figure and description given by Professor Peck, in which the whitish bands and spot are wanting, and there are three interrupted dusky lines across the fore wings, with an oblique blackish dash near the tip. Perhaps they constitute a different species from that of the true canker-worm moth. Should this be the case, the latter may be called *Anisopteryx pometaria*, or the anisopteryx of the orchard, while the former should retain the name originally given to it by Professor Peck. The female is wingless, and its antennæ are short, slender, and naked. Its body approaches to an oval form, but tapers, and is turned up behind. It is dark ash-colored above, and gray beneath.

It was formerly supposed that the canker-worm moths came out of the ground only in the spring. It is now known that many of them rise in the autumn and in the early part of the winter. In mild and open winters I have seen them in every month from October to March. They begin to make their appearance after the first hard frosts in the autumn, usually towards the end of October, and they continue to come forth, in greater or smaller numbers, according to the mildness or severity of the weather after the frosts have begun. Their general time of rising is in the spring, beginning about the middle of March, but sometimes before, and sometimes after this time; and they continue to come forth for the space of about three weeks. It has been observed that there are more females than males among those that appear in the autumn and winter, and that the males are most abundant in the spring. The sluggish females instinctively make their way towards the nearest trees, and creep slowly up their trunks. In a few days afterwards they are followed by the winged and active males, which flutter about and accompany them in their ascent, during which the insects pair. Soon after this, the females lay their eggs upon the branches of the trees, placing them on their ends, close together in rows, forming clusters of from sixty to one hundred eggs or more, which is the number usually laid by each female. The eggs are glued to each other and to the bark, by a grayish varnish, which is impervious to water; and the clusters are thus securely fastened in the forks of the small branches, or close to the young twigs and buds. Immediately after the insects have thus provided for a succession of their kind, they begin to languish, and soon die. The eggs are usually hatched between the first and the middle of May, or about the time that the red currant is in blossom, and the young leaves of the apple tree begin to start from the bud and grow. The little canker-worms, upon making their escape from the eggs, gather upon the tender leaves, and, on the occurrence of cold and wet weather, creep for shelter into the bosom of the bud, or into the flowers, when the latter appear. As this treatise may fall into the hands of persons who are not acquainted with the habits and devastations of our canker-worms, it should be stated that, where these insects prevail, they are most abundant on apple and elm trees; but that cherry, plum, and lime trees, and some other cultivated and native trees, as well as many shrubs, often suffer severely from their voracity. The leaves first attacked will be found pierced with small holes; these become larger and more irregular when the canker-worms increase in size: and, at last, the latter eat nearly all the pulpy parts of the leaves, leaving little more than the midrib and veins. A very great difference of color is observable among canker-worms of different ages, and even among those of the same age and size. It is possible that some of these variations may arise from a difference of species; but it is also true that the same species varies much in color. When very young, they have two minute warts on the top of the last ring; and they are then generally of a blackish or dusky brown color, with a yellowish stripe on each side of the body; there are two whitish bands across the head; and the belly is also whitish. When fully grown, these individuals become ash-colored on the back, and black on the sides, below which the pale yellowish line remains. Some are found of a dull, greenish yellow, and others of a clay color, with slender interrupted blackish lines on the sides, and small spots of the same color on the back. Some are green, with two white stripes on the back. The head and the feet partake of the general color of the body; the belly is paler. When not eating, they remain stretched out at full length, and resting on their fore and hind legs, beneath the leaves. When fully grown and well fed, they measure nearly or quite one inch in length. They leave off eating when about four weeks old,* and begin to quit the trees; some creep down by the trunk, but great numbers let themselves down by their threads from the branches, their instincts prompting them to get to the ground by the most direct and easiest course. When thus descending, and suspended in great numbers under the limbs of trees overhanging the road, they are often swept off by passing carriages, and are thus conveyed to other places. After reaching the ground, they immediately burrow in the earth, to the depth of from two to six inches, unless prevented by weakness or the nature of the soil. In the latter case, they die, or undergo their transformations on the surface. In the former, they make little cavities or cells in the ground, by turning round repeatedly and fastening the loose grains of earth about them with a few silken threads. Within twenty-four hours afterwards, they are changed to chrysalids in their cells. The chrysalis is of a light brown color, and varies in size according to the sex of the insect contained in it; that of the female being the largest, and being destitute of a covering for wings, which is found in the chrysalis of the males. The occurrence of mild weather after a severe frost stimu-

* In the year 1841, the red currant flowered, and the canker-worms appeared, on the 15th of May. The insects were very abundant on the 15th of June, and on the 17th scarcely one was to be seen.

lates some of these insects to burst their chrysalis skins and come forth in the perfected state; and this last transformation, as before stated, may take place in the autumn, or in the course of the winter, as well as in the spring; it is also retarded, in some individuals, for a year or more beyond the usual time. They come out of the ground mostly in the night, when they may be seen struggling through the grass as far as the limbs extend from the body of the trees under which they had been buried. As the females are destitute of wings, they are not able to wander far from the trees upon which they had lived in the caterpillar state. Canker-worms are therefore naturally confined to a very limited space, from which they spread year after year. Accident however, will often carry them far from their native haunts, and in this way probably they have extended to places remote from each other. Where they have become established, and have been neglected, their ravages are often very great. In the early part of the season, the canker-worms do not attract much attention; but it is in June, when they become extremely voracious, that the mischief they have done is rendered apparent, when we have before us the melancholy sight of the foliage of our fruit trees and of our noble elms reduced to withered and lifeless shreds, and whole orchards looking as if they had been suddenly scorched with fire.

In order to protect our trees from the ravages of canker-worms, where these looping spoilers abound, it should be our aim, if possible, to prevent the wingless females from ascending the trees to deposite their eggs. This can be done by the application of tar around the body of the tree, either directly on the bark, as has been the most common practice, or, what is better, over a broad belt of clay mortar, or on strips of old canvass or of strong paper, from six to twelve inches wide, fastened around the trunk with strings. The tar must be applied as early as the first of November, and perhaps in October, and it should be renewed daily as long as the insects continue rising; after which the bands may be removed, and the tar should be entirely scraped from the bark. When all this has been properly and seasonably done, it has proved effectual. The time, labor and expense attending the use of tar, and the injury that it does the trees when allowed to run and remain on the bark, have caused many persons to neglect this method, and some to try various modifications of it, and other expedients. Among the modifications may be mentioned a horizontal and close-fitting collar of boards, fastened around the trunk, and smeared beneath with tar; or four boards, nailed together like a box, without top or bottom, around the base of the tree, to receive the tar on the outside. These can be used to protect a few choice trees in a garden, or around a house or a public square, but will be found too expensive to be applied to any great extent. Collars of tin plate, fastened around the trees, and sloping downwards like an inverted tunnel, have been proposed, upon the supposition that the moths would not be able to creep in an inverted position, beneath the smooth and sloping surface. This method will also prove too expensive for general adoption, even should it be found to answer the purpose. A belt of cotton-wool, which it has been thought would entangle the feet of the insects, and thus keep them from ascending the trees, has not proved an effectual bar to them. Little square or circular troughs of tin or of lead, filled with cheap fish oil, and placed around the trees, three feet or more above the surface of the ground, with a stuffing of cloth, hay, or sea-weed between them and the trunk, have long been used by various persons in Massachusetts with good success; and the only objections to them are the cost of the troughs, the difficulty of fixing and keeping them in their places, and the injury suffered by the trees when the oil is washed or blown out and falls upon the bark. Mr. Jonathan Dennis, jr., of Portsmouth, Rhode Island, has obtained a patent for a circular leaden trough to contain oil, offering some advantages over those that have heretofore been used, although it does not entirely prevent the escape of the oil, and the nails, with which it is secured, are found to be injurious to the trees. These troughs ought not to be nailed to the trees, but should be supported by a few wooden wedges driven between them and the trunks. A stuffing of cloth, cotton or tow, should never be used; sea-weed and fine hay, which will not absorb the oil, are much better. Before the troughs are fastened and filled, the body of the tree should be well coated with clay paint or white wash, to absorb the oil that may fall upon it. Care should be taken to renew the oil as often as it escapes or becomes filled with the insects. These troughs will be found more economical and less troublesome than the application of tar, and may safely be recommended and employed, if proper attention is given to the precautions above named. Some persons fasten similar troughs, to contain oil, around the outer sides of an open box enclosing the base of the tree, and a projecting ledge is nailed on the edge of the box to shed the rain; by this contrivance, all the danger of hurting the tree with the oil is entirely avoided. In the 'Manchester Guardian," an English newspaper, of the 4th of November, 1840, is the following article on the use of melted Indian rubber to prevent insects from climbing up trees:—

"At a late meeting of the Entomological Society, [of London?] Mr. J. H. Fennell communicated the following successful mode of preventing insects ascending the trunks of fruit trees. Let a piece of Indian rubber be burnt over a gallipot, into which it will gradually drop in the condition of a viscid juice, which state, it appears, it will always retain; for Mr. Fennell has, at the present time, some which has been melted for upwards of a year, and has been exposed to all weathers without undergoing the slightest change. Having melted the Indian rubber, let a piece of cord or worsted be smeared with it, and then tied several times round the trunk. The melted substance is so very sticky, that the insects will be prevented, and generally captured, in their attempts to pass over it. About three pennyworth of Indian rubber is sufficient for the protection of twenty ordinary sized fruit trees."

Applied in this way, it would not be sufficient to keep the canker-worm moths from getting up the trees; for the first comers would soon bridge over the cord with their bodies, and thus afford a passage to their followers. To insure success, it should be melted in larger quantities, and daubed with a brush upon strips of cloth or paper, fasten-

ed round the trunks of the trees. Worn out Indian rubber shoes, which are worth little or nothing for any other purpose, can be put to this use. This plan has been tried by a few persons in the vicinity of Boston, some of whom speak favorably of it. It has been suggested that the melted rubber might be applied immediately to the bark without injuring the trees. A little conical mound of sand surrounding the base of the tree is found to be impassable to the moths, so long as the sand remains dry; but they easily pass over it when the sand is wet, and they come out of the ground in wet, as often as in dry weather.

Some attempts have been made to destroy the canker-worms after they were hatched from the eggs, and were dispersed over the leaves of the trees. It is said that some persons have saved their trees from these insects by freely dusting air-slacked lime over them while the leaves were wet with dew. Showering the trees with mixtures that are found useful to destroy other insects has been tried by a few, and although attended with a good deal of trouble and expense, it may be worth our while to apply such remedies upon small and choice trees. Mr. David Haggerston, of Waterton, Ms., has used for this purpose a mixture of water and oil-soap, (an article to be procured from the manufactories where whale oil is purified,) in the proportion of one pound of the soap to seven gallons of water; and he states that this liquor, when thrown on the trees with a garden engine, will destroy the canker-worm and many other insects, without injuring the foliage or the fruit. Jarring or shaking the limbs of the trees will disturb the canker-worms, and cause many of them to spin down, when their threads may be broken off with a pole; and if the troughs around the trees are at the same time replenished with oil, or the tar is again applied, the insects will be caught in their attempts to creep up the trunks. In the same way, also, those that are coming down the trunks to go into the ground will be caught and killed. If greater pains were to be taken to destroy the insects in the caterpillar state, their numbers would soon greatly diminish.

Even after they have left the trees, have gone into the ground, and have changed their forms, they are not wholly beyond the reach of means for destroying them. One person told me that his swine, which he was in the habit of turning into his orchard in the autumn, rooted up and killed great numbers of the chrysalids of the canker-worms. Some persons have recommended digging or ploughing under the trees in autumn, with the hope of crushing some of the chrysalids by so doing, and of exposing others to perish with the cold of the following winter. If hogs are then allowed to go among the trees, and a few grains of corn are scattered on the loosened soil, these animals will eat many of the chrysalids as well as the corn, and will crush others with their feet. Mr. S. P. Fowler* thinks it better to dig round the trees in July, while the shells of the insects are soft and tender. He and Mr. John Kenrick, of Newton, Mass., advise us to remove the soil to the distance of four or five feet from the trunk of the trees, and to the depth of six inches, to cart it away and replace it with an equal quantity of compost or rich earth. In this way, many of the insects will be removed also; but, unless the earth thus carried away, is thrown into some pond, hole, and left covered with water, many of the insects contained in it will undergo their transformations, and come out alive the next year.

Canker-worms are subject to the attacks of many enemies. Great numbers of them are devoured by several kinds of birds, which live almost entirely upon them during their season. They are also eaten by a very large and splendid ground-beetle, (*Calosoma scrutator*,) that appears about the time when these insects begin to leave the trees. These beetles do not fly, but they run about in the grass after the canker-worms, and even mount upon the trunks of the trees to seize them as they come down. The latter are also stung by a four-winged ichneumon-fly, which deposites an egg in every canker-worm thus wounded. From the egg is hatched a little maggot, that preys on the fatty substance of the canker-worm, and weakens it so much that it is unable to go through its future transformations. I have seen one of these flies sting several canker-worms in succession, and swarms of them may be observed around the trees as long as the canker-worms remain. Their services, therefore, are doubtless very considerable. Among a large number of canker-worms, taken promiscuously from various trees, I found that nearly one-third of the whole were unable to finish their transformations, because they had been attacked by internal enemies of another kind. These were little maggots, that lived singly within the bodies of the canker-worms, till the latter died from weakness; after which the maggots underwent a change, and finally came out of the bodies of their victims in the form of small two-winged cuckoo-flies, belonging to the genus *Tachina*. Mr. E. C. Herrick, of New Haven, Connecticut, has made the interesting discovery that the eggs of the canker-worm moth are pierced by a tiny four-winged fly, a species of *Platygaster*, which goes from egg to egg, and drops in each of them one of her own eggs. Sometimes every canker-worm egg in a cluster will be found to have been thus punctured and seeded for a future harvest of the *Platygaster*. The young of this *Platygaster* is an exceedingly minute maggot, hatched within the canker-worm egg, the shell of which, though only one thirtieth of an inch long, serves for its habitation, and the contents for its food, till it is fully grown; after which it becomes a chrysalis within the same shell, and in due time comes out a *Platygaster* fly, like its parent. This last transformation Mr. Herrick found to take place towards the end of June, from eggs laid in November of the year before; and he thinks that the flies continue alive through the summer, till the appearance of the canker-worm moths in the autumn affords them the opportunity of laying their eggs for another brood. As these little parasites prevent the hatching of the eggs wherein they are bred, and as they seem to be very abundant, they must be of great use in preventing the increase of the canker-worm. Without doubt such wisely appointed means as these were once enough to keep within due bounds these noxious insects; but since our forests, their natural food, and our birds, their greatest enemies, have disappeared before

* See Yankee Farmer, of July 18, 1840, and New England Farmer, of June 2, 1841, for some valuable remarks by Mr. Fowler.

the woodman's axe and the sportsman's gun, we are left to our own ingenuity, perseverance, and united efforts, to contrive and carry into effect other means for checking their ravages.

Apple, elm, and lime trees are sometimes injured a good deal by another kind of span-worm, larger than the canker-worm. As they resemble the latter in their habits, and often live on the same trees, they can be kept in check by such means as are found useful when employed against canker-worms.

PLANT LICE.

Aphides, or plant-lice, as they are usually called, are among the most extraordinary of insects. They are found upon almost all parts of plants, the roots, stems, young shoots, buds, and leaves, and there is scarcely a plant which does not harbor one or two kinds peculiar to itself. They are, moreover, exceedingly prolific, for Reaumur has proved that one individual, in five generations, may become the progenitor of nearly six thousand millions of descendants. It often happens that the succulent extremities and stems of plants will, in an incredibly short space of time, become completely coated with a living mass of these little lice. These are usually wingless, consisting of the young and of the females only; for winged individuals appear only at particular seasons, usually in the autumn, but sometimes in the spring, and these are small males and larger females. After pairing, the latter lay their eggs upon or near the leaf-buds of the plant upon which they live, and, together with the males, soon afterwards perish.

The genus to which plant-lice belong is called *Aphis*, from a Greek word which signifies to exhaust. The following are the principal characters by which they may be distinguished from other insects. Their bodies are short, oval, and soft, and are furnished at the hinder extremity with two little tubes, knobs, or pores, from which exude almost constantly minute drops of a fluid as sweet as honey; their heads are small, their beaks are very long and tubular, their eyes are globular, but they have not eyelets, their antennæ are long, and usually taper towards the extremity, and their legs are also long and very slender, and there are only two joints to their feet. Their upper are nearly twice as large as the lower wings, are much longer than the body, are gradually widened towards the extremity, and nearly triangular; they are almost vertical when at rest, and cover the body above like a very sharp-ridged roof.

The winged plant-lice provide for a succession of their race by stocking the plants with eggs in the autumn, as before stated. These are hatched in due time in the spring, and the young lice immediately begin to pump up sap from the tender leaves and shoots, increase rapidly in size, and in a short time come to maturity. In this state, it is found that the brood, without a single exception, consists wholly of females, which are wingless, but are in a condition immediately to continue their kind. Their young, however, are not hatched from eggs, but are produced alive, and each female may be the mother of fifteen or twenty young lice in the course of a single day. The plant-lice of this second generation are also wingless females, which grow up and have their young in due time; and thus brood after brood is produced, even to the seventh generation or more, without the appearance or intervention, throughout the whole season, of a single male. This extraordinary kind of propagation ends in the autumn with the birth of a brood of males and females, which in due time acquire wings and pair; eggs are then laid by these females, and with the death of these winged individuals, which soon follows, the race becomes extinct for the season.

Plant lice seem to love society, and often herd together in dense masses, each one remaining fixed to the plant by means of its long tubular beak; and they rarely change their places till they have exhausted the part first attacked. The attitudes and manners of these little creatures are exceedingly amusing. When disturbed, like restive horses they begin to kick and sprawl in the most ludicrous manner. They may be seen at times suspended by their beak alone, and throwing up their legs as if in a high frolic, but too much engaged in sucking to withdraw their beaks. As they take in great quantities of sap, they would soon become gorged if they did not get rid of the superabundant fluid through the two little tubes or pores at the extremity of their bodies. When one of them gets running-over full, it seems to communicate its uneasy sensations, by a kind of animal magnetism, to the whole flock, upon which they all, with one accord, jerk upwards their bodies, and eject a shower of the honeyed fluid.

The leaves and bark of plants much infested by these insects are often completely sprinkled over with drops of this sticky fluid, which on drying becomes dark-colored, and greatly disfigures the foliage. This appearance has been denominated honey-dew; but there is another somewhat similar production observable on plants, after very dry weather, which has received the same name, and consists of an extravasation or oozing of the sap from the leaves. We are often apprized of the presence of plant-lice on plants growing in the open air, by the ants ascending and descending the stems. By observing the motions of the latter, we soon ascertain that the sweet fluid discharged by the lice is the occasion of these visits. The stems swarm with slim and hungry ants, running upwards, and others lazily descending, with their bellies swelled almost to bursting. When arrived in the immediate vicinity of the plant-lice, they greedily wipe up the sweet fluid which has distilled from them, and, when this fails, they station themselves among the lice, and catch the drops as they fall. The lice do not seem in the least annoyed by the ants, but live on the best possible terms with them; and, on the other hand, the ants, though unsparing of other insects weaker than themselves, upon which they frequently prey, treat the plant-lice with the utmost gentleness, caressing them with their antennæ, and apparently inviting them to give out the fluid by patting their sides. Nor are the lice inattentive to these solicitations, when in a state to gratify the ants, for whose sake they not only seem to shorten the periods of the discharge, but actually yield the fluid when thus pressed. A single louse has been known to give it drop by drop successively to a number of ants, that were waiting anxiously to receive it. When the plant-lice cast their skins, the ants instantly remove the latter, nor will they allow any dirt or rubbish to remain

upon or about them. They even protect them from their enemies, and run about them in the hot sunshine to drive away the little ichneumon flies that are for ever hovering near to deposite their eggs in the bodies of the lice.

Plant-lice differ very much in form, color, clothing, and in the length of the honey-tubes. Some have these tubes quite long, as the rose-louse, *Aphis rosæ*, which is green, and has a little conical projection or stylet, as it is called, at the extremity of the body, between the two honey-tubes. The cabbage-louse, *Aphis brassicæ*, has also long honey-tubes, but its body is covered with a whitish mealy substance. This species is very abundant on the under side of cabbage leaves in the month of August. The largest species known to me is found in clusters beneath the limbs of the pig-nut hickory (*Carya porcina*,), in all stages of growth, from the 1st to the middle of July. It is the *Aphis caryæ* of my Catalogue. Its body, in the winged state, measures one quarter of an inch to the end of the abdomen, and above four-tenths of an inch to the tips of the upper wings, which expand rather more than seven-tenths of an inch. It has no terminal stylet, and the honey-tubes are very short. Its body is covered with a bluish-white substance, like the bloom of a plum, with four rows of little transverse black spots on the back; the top of the thorax, and the veins of the wings are black, as are also the shanks, the feet, and the antennæ, which are clothed with black hairs; the thighs are reddish-brown. This species sucks the sap from the limbs and not from the leaves of the hickory. There is another large species, living in the same way on the under side of the branches of various kinds of willows, and clustered together in great numbers. About the first of October they are found in the winged state. The body is one-tenth of an inch in length, and the wings expand about four-tenths. The stylet is wanting; the body is black and without spots; the wings are transparent, but their veins, the short honey tubercles, the third joint of the antennæ, and the legs are tawny yellow. This species cannot be identical with the willow-louse, *Aphis salicis* of Linnæus, which has a spotted body; and therefore I propose to call it *Aphis salicti*, the plant-louse of willow groves. When crushed, it communicates a stain of a reddish or deep orange color.

Some plant-lice live in the ground and derive their nourishment from the roots of plants. We annually lose many of our herbaceous plants, if cultivated in a light soil, from the exhausting attacks of these subterranean lice. Upon pulling up China asters, which seemed to be perishing from no visible cause, I have found hundreds of little lice, of a white color, closely clustered together on the roots. I could never discover any of them that were winged, and therefore conclude from this circumstance, as well as from their peculiar situation, that they never acquire wings. Whether these are of the same species as the *Aphis radicum* of Europe, I cannot ascertain, as no sufficient description of the latter has ever come to my notice. These little lice are attended by ants, which generally make their nests near the roots of the plants, so as to have their milch kine, as the plant-lice have been called, within their own habitations: and in consequence of the combined operations of the lice and the ants, the plants wither and prematurely perish. When these subterranean lice are disturbed, the attendant ants are thrown into the greatest confusion and alarm; they carefully take up the lice which have fallen from the roots, and convey them in their jaws into the deep recesses of their nests; and here the lice still contrive to live upon the fragments of the roots left in the soil. It is stated in Kirby and Spence's Introduction to Entomology, that the ants bestow the same care and attention upon the root-lice as upon their own offspring—that they defend them from the attacks of other insects, and carry them about in their mouths to change their pasture; and that they pay particular attention to the eggs of the lice, frequently moistening them with their tongues, and in fine weather bringing them to the surface of the nest, to give them the advantage of the sun. On the other hand, the sweet fluid supplied in abundance by these lice forms the chief nutriment both of the ants and their young, which is sufficient to account for their solicitude and care for their valuable herds.

The peach tree suffers very much from the attacks of plant-lice, which live under the leaves, causing them by their punctures to become thickened, to curl or form hollows beneath, and corresponding crispy and reddish swellings above, and finally to perish and drop off prematurely. Whether our insect is the same as the European aphis of the peach tree (*Aphis Persicæ* of Sulzer,) I cannot determine, for the want of a proper description of the latter. The depredations of these lice is one of the causes, if not the only cause, of the peculiar malady affecting the peach tree in the early part of summer, and called the blight.

The injuries occasioned by plant-lice are much greater than would at first be expected from the small size and extreme weakness of the insects; but these make up by their numbers what they want in strength individually, and thus become formidable enemies to vegetation. By their punctures, and the quantity of sap which they draw from the leaves, the functions of these important organs are deranged or interrupted, the food of the plant, which is there elaborated to nourish the stem and mature the fruit, is withdrawn, before it can reach its proper destination, or is contaminated and left in a state unfitted to supply the wants of vegetation.

Plants are differently affected by these insects. Some wither and cease to grow, their leaves and stems put on a sickly appearance, and soon die from exhaustion. Others, though not killed, are greatly impeded in their growth, and their tender parts, which are attacked, become stunted, curled, or warped.

The punctures of these lice seem to poison some plants, and affect others in a most singular manner, producing warts or swellings, which are sometimes solid and sometimes hollow, and contain in their interior a swarm of lice, the descendants of a single individual, whose punctures were the original cause of the tumor. I have seen reddish tumors of this kind, as big as a pigeon's egg, growing upon leaves, to which they were attached by a slender neck, and containing thousands of small lice in their interior. Naturalists call these tumors galls, because they seem to be formed in the same way as the oak galls which

are used in the making of ink. The lice which inhabit or produce them, generally differ from the others, in having shorter antennæ, being without honey-tubes, and in frequently being clothed with a kind of white down, which, however, disappears when the insects become winged.

These downy plant-lice are now placed in the genus *Eriosoma*, which means woolly body, and the most destructive species belonging to it was first described under the name of *Aphis lanigera*, by Mr Hausmann, in the year 1801, as infesting the apple trees in Germany. It seems that it had been noticed in England as early as the year 1787, and has since acquired there the name of American blight, from the erroneous supposition that it had been imported from this country. It was known, however, to the French gardeners for a long time previous to both of the above dates, and, according to Mr Renie, is found in the orchards, about Harfleur, in Normandy, and is very destructive to the apple trees in the department of Calvados. There is now good reason to believe that the miscalled American blight is not indigenous to this country, and that it has been introduced here with fruit trees from Europe. Some persons, indeed, have supposed that it was not to be found in this country, at all, but the late Mr Buel has stated that it existed on his apple trees, and I have once or twice seen it on apple trees in Massachusetts, where, however, it stills appears to be rare, and consequently I have not been able to examine the insects sufficiently myself. The best account that I have seen of them is contained in Knapp's Journal of a Naturalist," from which, and from Hausmann's description, the following observations are chiefly extracted.

The eggs of the woolly apple tree louse are so small as not to be distinguished without a microscope, and are enveloped in a cotton-like substance furnished by the body of the insect. They are deposited in the crotches of the branches and in the chinks of the bark at or near the surface of the ground, especially if there are suckers springing from the same place. The young, when first hatched, are covered with a very short and fine down, and appear in the spring of the year like little specks of mould on the trees. As the season advances, and the insect increases in size, its downy coat becomes more distinct, and grows in length daily. This down is very easily removed, adheres to the fingers when it is touched, and seems to issue from all the pores of the skin of the abdomen. When fully grown, the insects of the first brood are one tenth of an inch in length, and when the down is rubbed off, the head, antennæ, sucker, and shins are found to be of a blackish color, and the abdomen honey-yellow. The young are produced alive during the summer, are buried in masses of the down, and derive their nourishment from the sap of the bark and of the alburnum or young wood immediately under the bark. The adult insects never acquire wings, at least such is the testimony both of Hausmann and Knapp, and are destitute of honey-tubes, but from time to time emit drops of a sticky fluid from the extremity of the body. These insects, though destitute of wings, are conveyed from tree to tree by means of their long down, which is so plentiful and so light as easily to be wafted by the winds of autumn, and thus the evil will gradually spread throughout an extensive orchard. The numerous punctures of these lice produce on the tender shoots a cellular appearance, and wherever a colony of them is established, warts or excresences arise on the bark; the limbs thus attacked become sickly, the leaves turn yellow and drop off; and, as the infection spreads from limb to limb, the whole tree becomes diseased, and eventually perishes. In Gloucestershire, England, so many apple trees were destroyed by these lice in the year 1810, that it was feared the making of cider must be abandoned. In the north of England the apple trees are greatly injured, and some annually destroyed by them, and in the year 1826, they abounded there in such incredible luxuriance, that many trees seemed, at a short distance, as if they had been whitewashed.

Mr. Knapp thinks that remedies can prove efficacious in removing this evil only upon a small scale, and that when the injury has existed for some time, and extended its influence over the parts of a large tree, it will take its course, and the tree will die. He says that he has removed this blight from young trees, and from recently attacked places in those more advanced, by painting over every node or infected part of the tree with a composition consisting of three ounces of melted resin mixed with the same quantity of fish oil, which is to be put on while warm, with a painter's brush.

Sir Joseph Banks succeeded in extirpating the insects from his own trees by removing all the old and rugged bark, and scrubbing the trunk and branches with a hard brush. The application of the spirits of tar, of spirits of turpentine, of oil, urine, and of soft soap, has been recommended. Mr Buel found that oil sufficed to drive the insects from the trunks and branches, but that it could not be applied to the roots, where he stated numbers of the insects harbored.

The following treatment I am inclined to think will prove as successful as any which has heretofore been recommended. Scrape off all the rough bark of the infected trees and make them perfecily clean and smooth early in the spring; then rub the trunk and limbs with a stiff brush wet with a solution of potash, as hereafter recommended for the destruction of bark lice; after which remove the sods and earth around the bottom of the trunk, and with the scraper, brush and alkaline liquor, cleanse that part as far as the roots can conveniently be uncovered. The earth and sods should immediately be carried away, fresh loam should be placed around the roots, and all cracks and wounds should be filled with grafting cement or clay mortar. Small limbs and extremities of branches, if infected, and beyond reach of the applications, should be cut off and burned.

There are several other species of *Eriosoma* or downy lice in this state, inhabiting various forest and ornamental trees, some of which may also have been introduced from abroad. The descriptions of foreign plant-lice are mostly so brief and imperfect that it is impossible to ascertain from them which of our species are identical with those of Europe; I shall therefore omit any further account of these insects, and close this part of the subject with a few remarks on the remedies to be employed for their destruction generally, and some notice of the natural enemies of plant-lice.

Solutions of soap, or a mixture of soap-suds and tobacco-water, used warm, and applied with a watering pot or with a garden engine, may be em-

ployed for the destruction of these insects. It is said that hot water may also be employed for the same purpose with safety and success. The water, tobacco-tea, or suds, should be thrown upon the plants with considerable force, and if they are of the cabbage or lettuce kind, or other plants whose leaves are to be used as food, they should subsequently be drenched thoroughly with pure water. Lice on the extremities of branches may be killed by bending over the branches and holding them for several minutes in warm and strong soap-suds. Lice multiply much faster, and are more injurious to plants, in a dry than in a wet atmosphere; hence in green houses, attention should be paid to keep the air sufficiently moist, and the lice are readily killed by fumigations with tobacco or with sulphur. To destroy subterranean lice on the roots of plants I have found that watering with salt water was useful, if the plants were hardy; but tender, herbaceous plants cannot be treated in this way, but may sometimes be revived, when suffering from these hidden foes, by free and frequent watering with soap-suds.

NOVEL MODE OF CULTIVATING CORN.

Extract from the Louisville Journal.

My universal rule is, to plough my corn land the fall preceding the spring when I plant; and as early in the spring as possible, I cross-plough as deep as circumstances will permit, and as soon as this is done, I commence checking off the first way with my large ploughs, and the second with my small ones, the checks, three feet by three, admitting of working the land both ways. And then I plant my corn from the 20th to the 25th of March—a rule to which I adhere with scrupulous exactness; planting from eight to twelve grains in each hill, covering the same *from four to six inches deep*, greatly preferring the latter depth; and in this particular I take more pride and more pains than any other farmer in Kentucky, holding it as my ruling principle, that the product of the corn crop depends very much upon its being properly covered, and much on its being properly ploughed the first time. So soon as my corn crop is up of sufficient height, I start the large harrow directly over the rows, allowing a horse to walk each side, harrowing the way the corn was planted; and on land prepared as above and harrowed as directed, the hoeing part will be so completely performed by this process, that it will satisfy the most skeptical. Then, allowing the corn thus harrowed to remain a few days, I start my small ploughs with the bar next the corn; and so nicely will this be done, that when a row is thus ploughed, so completely will the intermediate spaces, hills, &c., be lapped in by the loose earth occasioned by this system of close ploughing, as to render any other work useless for a time. I thin to four stalks upon a hill, never having to transplant, the second ploughing being performed with the mouldboard towards the rows of corn; and so rapid has been the growth of the corn between the first and second ploughings, that this is performed with ease; and when in this stage, I consider my crop safe; my general rule being, never to plough my corn more than four times, and harrow once. My practice is, to put a field in corn two successive years, then grass it, and let it lie eight years, a rule from which I never deviate. Now, I do not pretend that the labor bestowed upon a sod-field, to put it in a state of thorough cultivation, does not meet with a fair equivalent from one crop, but I presume no farmer will doubt when I say, the second year's crop from sod-land is better than the first, with not more than one half the labor. The best system of farming is, to produce the greatest amount of profit from the smallest amount of labor.

I lay it down as an axiom incontrovertible in the cultivation of corn, that whenever a large crop has been raised, it was the result of close and early planting; and I defy proof to the contrary. I plant my corn three feet by three, four stalks in a hill, and allow but one ear to a stalk, and one hundred ears to a bushel, and then ascertain how many hills there are in a shock, sixteen hills square, which is the usual custom to put it up. My present crop, planted on the 20th of March, bids fair to outstrip any preceding one; I am now ploughing and thinning the first planting.

WALTER C. YOUNG.

Jessamine co., Ky., April 26, 1842.

MANURES.

According to Liebig, the evacuations of an adult, liquid and solid, will annually yield 547 lbs. or one and a half pound per day. This is sufficient to manure fully one acre of wheat or other grain. But even in the modes of preserving and using it by the aid of lime, much of its ammonia is wasted; and it has been shown, that to the ammonia the wheat owes its nitrogen, the element on which we have most to depend for improvement, both in quality and quantity. Lime should no more be mixed with night soil, than with gas liquor; on the contrary, the matters added to absorb the liquid, should have an acid tendency. Gypsum does very well by double decomposition. Peat earth is acidulous enough to fix the ammonia, where at hand; but in large towns, this earth often requires pretty distant carriage. Refuse bark is, however, generally produced in populous places, and is an incumbrance to the tanner, from which he is obliged to contrive various methods for relieving himself; amongst the rest burning, to the great annoyance and suffering of the neighborhood.

But tanners' refuse bark has also enough acidulous quality to fix the ammonia in night soil; and being so generally at hand in populous towns, may be employed for the purpose extensively.

Three parts of tanners' bark to one of night-soil (urine included, which is as valuable as any part,) will make a stronger manure than stable-dung; and with this further advantage, that the stable-dung requires to be rotted, to reduce the long straws, and kill the undigested seeds it contains; whilst the bark being already short, and the night-soil containing no seeds, it may be carted to the field at once; thus saving the heavy waste in rotting.

In the tan-yard, the bark may be stercorized, by having a privy or two, and suitable corners for the work people, all made to drain upon the

heap; calculating say one pound of evacuations liquid and solid from each individual per day, and proportioning the bark to it; what is above that quantity being disposed of to other persons, for the same purpose. All the hide wool and glue washings and house drainings should run into the same, which should be roofed over to keep off the rain, but with open sides to encourage evaporation of the moisture. All the ashes of fires, whether of the works or house, should be added, to help the absorption, and destroy the smell; and by this means, a tanner employing twenty-five hands, may turn out twenty-five pounds evacuations; add three times the quantity of tanners' bark seventy-five pounds; add for ashes, &c., above detailed, and we have one hundred and fifty pounds of manure per day, richer than stable dung, much better for wheat, and losing nothing in rotting as not required. In other places, as private gardens, school grounds, &c., the bark may be procured from the tanner, and added to the privy sink, in rather larger proportions, reckoning the evacuations as one and a half pounds per entire day of twenty-four hours. Much less bark will do, say half as much as the night-soil, making up the quantity with garden mould; but the bark is so much additional vegetable matter, at little cost. It may be thrown in, a load at a time, for the excrement to fall upon; but the ashes should be added daily, so as to lie on the top, and absorb the smell. A long and large trunk should rise from the sink, to encourage evaporation and carry up, also, the smell still remaining; for although much subdued by ashes, it cannot be altogether destroyed, without careful mixture, not practicable for such a purpose. In this manner large quantities may be collected.

Peat earth will do instead of bark, as above stated, with the precaution not to throw it in cohesive lumps, which will not absorb, but as dry and crumbly as possible. The ashes are equally useful in either case.—*Eng. paper.*

EXTRACTS FROM PROCEEDINGS OF THE SOUTH WILTS AND WARMINSTER (ENG.) FARMERS' CLUB.

From the London Farmers' Magazine, for June, 1842.

The first subject for discussion was "on drills."

An intelligent member, who brought this forward, said he had drilled for many years, and had derived much benefit from such a practice; that he had used the horse-hoe with much success on his farm, principally a light soil, in the spring—which was an efficient and economical means of cleaning it: and that, in his opinion, there was a saving of seed in pursuing such a system—in wheat of at least half a bushel per acre, and in barley of as much as two bushels. With regard to the produce, he had generally grown more in grain when drilled than when sown broadcast, although a smaller proportion of seed was used; the *straw*, however, he admitted, was generally deficient. The same system applied equally to turnips, vetches, &c. Many members present seemed to concur in this practice as a desirable one; but some dissented from it, arguing that the broadcast principle produced as much corn, at less expense; and that although it frequently occurred that more grain was sown than when the drill was used it was not necessary; and that an equal quantity of seed would yield quite as favourable a result. Much discussion arose as to which was the best, as well as the most economical system to pursue, the drilled or broadcast; but the members present not having made correct calculations on the point, no resolution was agreed on, reserving the subject for a future meeting.

Second subject.—"The diseases of sheep, particularly giddiness."

The member who introduced this subject said, he was anxious to obtain information, rather than offer it, as to the cause and cure of giddiness in sheep; the disease being one of much aggravation to the farmer, who frequently suffered much pecuniary loss by not knowing how to treat it efficaciously. A gentleman of the medical profession being present, was called on for some explanation—and stated he knew but little of the diseases of animals, but thought there was a much greater resemblance between them and the diseases of the human subject than was generally supposed. He believed the disease in question was similar in its character and consequences to that known as water on the brain in the human species; like that, he understood, it more frequently attacked *young subjects*. He was not surprised to hear that the cases were almost universally fatal, as from the nature of the disease he should expect that to be the case. It was doubtless inflammatory affection of the brain, or its membranes, speedily terminating in an effusion of fluid. Even in young children, though watched as they are by their mothers, it but too commonly escaped early notice, and when the disease was once established, he regretted to say, any treatment availed but little. In cases of giddy sheep, he had known the trephine used, and the effused fluid evacuated; but had never heard of a case terminating in recovery. This is just what he should expect, as the delicate structure of the brain was too much disorganized by the disease to admit of its being restored to a healthy state. He feared he could give them but little hope of their arriving at any satisfactory treatment; indeed, unless the disease was detected in the early inflammatory stage, before effusion had taken place, when copious bleeding might avail, he really thought there was nothing to be done. As to a prevention of the disease, this he thought would be best done by keeping the animal in the best state of general health possible, but even with that many cases must occur. He thought breeding in-and-in likely to increase the number of cases, as tending to produce degenerate stock.

Many members present felt the subject in question to be one of great importance, but were not enabled, from their experience, to adopt any satisfactory resolution relative to it.

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"*Paring and burning*" was brought forward by one of the largest farmers and most intelligent members of the society; he stated his opinion that nearly all soils were capable of it, with the exception of sands, and described the fertilizing properties of ashes; recommending that turf should be always removed where plantations were made, and the converting such turf into ashes instead of allowing it to rot; his calculation was,

that one acre of turf, burnt into ashes, was worth quite 30*l*., after all expenses of labor, &c., and suggested as a proper quantity 250 bushels per acre, mixing with it about two quarters of bone-dust. This mixture was more desirable than using either separately, as the ashes tended materially to force the plant in its early stage, rendering it less liable to the ravages of the fly; whilst the bone-dust told more commonly in ripening the plant and bringing it to perfection. Other members spoke in confirmation, and the following resolution was agreed on: Resolved—"That paring and burning is more beneficial than ploughing and rotting; but the subsequent cultivation should be on the alternate system, the first crop being in most cases a green crop. That the land should be pared as thinly as possible, and if so it does not reduce the quantity of the soil, is preventive of the wire-worm, and may be repeated with advantage as often as a new rug is produced."

ON THE ABOLITION OF THE FIXED BRIDLE OR BEARING REIN.*

From the London Farmers' Magazine, for June, 1842.

There is much mismanagement and consequent misery inflicted on horses through the force and continuance of custom, habit, and prejudice; particularly evinced by the use of the bearing-rein.

The editor is impelled by a wish to do good, promoted by attachment to the horse, and compassion for that much abused and most cruelly-treated animal; influenced too, as he hopes, by a sincere desire to serve and benefit the owners. It is his object, by what he trusts will be found sound reasoning, to bring into disrepute, and (as soon as may be) into disuse, that tormenting part of the harness, the fixed bridle or bearing-rein.

It is a principle in mechanics, that whenever agent or instrument suffers the least resistance from restraint, friction, or other wear or tear, it will do its office with the most care, with the greatest economy of time, and with the least expenditure of strength or money; and this whether the agent or instrument be an animal, or a machine. Hence, to ensure the full exercise of an animal's power in the safest and most easy way to itself, we should be careful not permanently to disturb its natural posture. The question to be decided is, whether or not it is most judicious and proper to give a horse the free use of his head, or to prevent him from having that use.

It must be admited that whenever a horse trips or stumbles, nature prompts him to try to save himself, and he instantly extends his neck and head for the purpose as a man would his arms: this natural effort increases the animal's danger if his head be at all confined by the bearing-rein, because the tug which he gives with his mouth is communicated to the harness upon his back to which the rein is hooked, and the effect is the same as if a man were with both his hands to lay hold of the collar of his coat to save himself. To render the bearing-rein or bridle of any utility in saving an animal from falling, it should be of great strength and substance, and fastened behind and above, or it will be useless.

The dorsal muscles or sinews of the back in all quadrupeds run longitudinally or horizontally from the head and tail, and those extremities are main working powers—what the arms are to a walker or laborer, the head and tail are to the animal; tie a man's arms to his side, and even a gentle push or trip will throw him down. This is the effect produced by the bearing rein. The horse's head being fixed, he is unable to use it as nature intended, and therefore if he trips or slides his head is of no use. When horses stumble, they often break the bearing-rein, and thus getting the head free, are enabled to save themselves. We all know that when a horse is down, the first thing done is to "give him his head" that he may get up. We do not mean to say that a horse will never stumble if worked without a bearing rein, because we know that they sometimes fall whilst loose in the field; but we assert, without fear of contradiction, that the surest way to keep a horse on his legs is at all times to give him the free use of his head. The more he is crippled, the more he needs his head. The bearing-rein may probably be of some use in "breaking* a colt," and may, perhaps, help to "get up his head" until he has been "taught his paces," but afterwards it can answer no end, except *souring his temper, making him jib, deadening his mouth, wasting his strength, hurting his wind, injuring his sight, lessening his speed, abridging his services, shortening his days, throwing him down, and breaking his knees*: all these, it is fearlessly asserted, proceed daily from the use of this cruel appendage.

When running loose, the horse's neck is usually extended as straight as his back; in this manner horses would generally work. It is the natural position, and the nearer we approach to it the better for the animal, for he is then at ease; and (though little remembered) his pulmonary action, or breathing unimpeded. It is absurd to make a bend or an angle, (if at all acute or sharp) in a water-pipe, or hose; so it is absurd and cruel too to bend back out of its natural line the windpipe of the horse by the use of the bearing-rein. In the former case a full volume of water cannot be obtained; in the latter the free breathing of the animal (so essential to its comfort, and even to its life) is hindered.† *Denied* this may be; *disproved* it cannot. The effect of restraining a horse by the bearing-rein, is to prevent him from getting up to the collar. If the bit is in the least degree affected by the bearing-rein; in other words, if it is not entirely loose in the mouth, the horse is checked, and besides being kept from the full free exercise of his strength, he is prevented from leaning the weight of his body into the collar.

We are aware that many who admit that bearing reins are not safe, use them because *they like to see a horse look well, like to see him hold his head up, &c.*; but a kind and humane man would

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* Observations on the effect of the fixed bridle, or bearing-rein, and a few words for the English post-horse.—Thomas, Plymouth.

* It would be well if there were more colt benders—the tempers of horses are not studied by the generality of colt breakers; horses' tempers vary as much as men's.

† It is the opinion of many eminent veterinary surgeons, that "roaring and blindness are produced in carriage-horses, and wagon-horses, by the bearing-reins.

not have such foolish desires; the care and comfort of his horse would be his only object. The mischievous effects before stated are often *overlooked* by many to whom the use of the bearing-rein is as natural as the saddle or any part of the harness. The editor has often found very kind and respectable men, wholly ignorant of the pain and agony which their horses have endured.

There is one infallible proof constantly to be obtained of the cruelty of the use of the bearing-rein, and of its injurious effects, though we believe very few persons are aware of it. Whenever a horse has been worked with a tight bearing-rein, the corners of his mouth become *raw, inflame, fester, and eventually the mouth becomes enlarged on each side*; in some cases to the extent of *two inches*. Even before the bit has produced these visible effects, if the corner of the mouth, under the bit, be touched, the animal will flinch as if from hot iron. Let this be the sign with every master and servant.

To what are these enlargements attributable? what causes them? Nothing but the friction of the bit in the efforts of the horse to get up to his work. How dreadful to see a horse heavily laden—his neck bent into a perfect curve—his mouth open—his eyes ready to start out of their sockets. The ignorant, though perhaps not cruelly disposed driver, looks on with admiration to see how "handsome" his horse appears, and imagines that the tossing head, open mouth, and gnashing teeth are signs of game and strength, whilst on the contrary, they are the most unequivocal evidence of distress and agony. Let any one test the truth of this by loosing the bearing-rein, and he will immediately find the horse go faster, keep his mouth shut, and his head in one steady horizontal position.* A short time since the editor stopped a wagon to look at the mouth of the shaft horse—he found the mouth actually cut open by the bit at least two inches on each side: the wagoner said "he know'd it sure, *'twas the fair wear of the ir'n!*" The man was open to conviction, and upon the cause of this dreadful punishment being shown he altered the rein.

The propensity to jib, if not actually caused, is much increased by the bearing-rein. In ascending a hill the freest horse may be compelled to stop and refuse to exert himself, knowing that he can put no more strength till the head is loose. A short time since, in Southampton-street, Covent Garden, the editor of this pamphlet saw a crowd collected looking at a scavenger's cart, fully loaded, drawn by an immense horse. The street is a moderate ascent, and the horse had stopped just below the top of the hill: the driver turned the horse round down the hill, then up, and with his help-mate very humanely assisted by pushing. The horse, without being flogged or spoken to, went on steadily with his very heavy load to about the place he before stopped at, and again "gave up:" he was sweating much, and appeared to be a game good horse. The editor went up to the driver and advised him to unhook the bearing-rein; the man said, "it's nau use, I have turned him around three times"—the editor said, "he must be a good horse to take to the load three times," and pressed him to unhook the rein; the man replied, "the ause 'ill fall down." The editor coaxed him to try, the rein was unhooked, and immediately the horse took the load from the spot where he stood: the man said, "he never saud it done afore." It is not uncommon for considerate drivers to unbear their horses at the foot of a hill, which is a very strong proof of the folly of using the rein at all. It has been and may again be advanced as a plea for its retention, that a horse after having been used to the rein will miss it, and so be liable to fall if he trips after it is taken off. A trial will prove that this is not the result.

It is a common opinion that when a horse trips or stumbles, it is the rider or driver who pulls him up, by the sudden jerk or shortening of his reins, and prevents an actual fall; hence the moment a horse takes a false step, the rider or driver tugs the rein with all his might. We frequently hear it said, "the horse was going to fall, but I pulled him up! I kept him on his legs!" As well might a fly resting on a coach-weel boast of its kicking up a dust; as well might a wagoner seated on the shafts, think to pull up a wagon which had lost its fore wheel. Such expressions are proofs of the ignorance of those who make them, because when they become aware of the fact that the horse has stumbled, the danger is over—the animal has recovered itself, and their tug is useless. To help an animal effectually there must be "where* to stand on," and both an arm and a rein strong enough. A bearing-rein is fixed to the falling horse and falls with him—it cannot save him; it keeps a horse from seeing and avoiding stones and other impediments, it is a hindrance not a help; an injury, and not a benefit. If he fall with a bearing-rein he must break his knees or the rein, or its hook, or the crupper; if he trips without one, and the driver "gives him his head," by instantly slackening the reins (what few inexperienced Englishmen will either do, or believe to be judicious) the creature is set at liberty, and will probably quickly recover himself, unless receiving, as he is almost sure to do, many heavy lashes. It cannot be supposed that a horse stumbles willingly, therefore to punch him for it is unjust, and only adds to his fear.

It must not, however, be inferred that all who use the bearing-rein approve of it. Servants, when men of humanity, experience, skill, and character, are often found to admit its folly and uselessness, but dare not lay it aside.

It is said that the ladies powerfully obstruct the removal of this useless and injurious instrument. It is hoped that the few who drive and the many who keep their own horses, will give the best and strongest denial to this scandalous imputation, by immediately reprobating the use of the rein. Could their poor horses answer the questions—Why do you continually toss your heads when standing in harness? Why do you stretch open your mouths, shake your heads, and gnash your

* The dray horses in London exhibit the most painful examples of the cruelty of using a tight bearing-rein. Whether at work or standing they will be found in continual torment—tossing their heads, or resting the weight of them on the bit, and so drawing back the corners of their mouths, as nearly to split the ligatures;—at work, instead of going on steadily, they, "bob" their heads, feeling the check at every step they take.

* Archimedes said, "Give me a place to stand on and I will move the world."

teeth? Why do you turn your heads back towards your sides, as if looking at the carriage? they would answer—all, all this is done to get relief from the agony we are enduring by having our heads kept erect, and our necks bent by tight bridles.

To ladies the editor would appeal with earnestness. His heart has ached when passing the horses of the nobility and others at the doors of houses in London, to see the unceasing motion of the heads of the poor creatures, the coachmen sitting at their ease, perfectly unconcerned, and often doubtless unconscious of the agonizing pain of the muscles and sinews of the neck the horses are enduring. No humane person could knowingly suffer such cruelty to be practised. It is true that to the eyes of ignorant people, horses tortured with the bearing-rein look "very fine," but the true connoisseur will never be pleased at such distortions.

England, where the best horses and the best drivers are to be found, England (it is said) is the only country in which that bane of the horse, the bearing-rein, is used! In France it is not used, and, as the natural consequence, horses in that country seldom fall to the ground, or so as to hurt themselves. At the very instant a horse stumbles the French coachman slackens the rein, that the horse may save himself.

It is sincerely hoped that the entire removal of this punishing bridle will be speedily effected by the powerful aid of veterinary surgeons, by the owners and drivers of private carriages, noble and gentle, at once abolishing this useless, tormenting appendage; by the society for the prevention of cruelty to animals lending to this good object their aid unitedly as a body, and individually as members; by giving circulation in newspapers and periodicals to the experience of the good effects of going without them; by the public patronizing those vehicles in which the servants do not use the bearing-rein; by humane travellers seeing well those coachmen who in this respect obey the dictates of humanity, sound policy, self-interest, and common sense. The editor is aware that no good coachman would condescend to use bearing-reins, and persons much accustomed to travelling, if they see the horses come out with bearing-reins, immediately conclude the driver is one of the old school, or that he is not "up to his work;" and they are generally right, for it will be found that he is not able to command his horses so well as the man who drives without them. The least reflection will show this must be so. If the horses have bearing-reins they lean their heads on them, and the coachman's reins may be seen loose and dangling on the horse's back; if on the contrary he drives without, he has the horses in hand always, and guides them as he pleases. This is more plainly the case with post-chaise drivers and hackney coachmen, whose reins are only used occasionally when they have bearing-bridles, instead of being always tight in their hands.

The effect of bearing-reins upon coach-horses is shown at every stage when the horses are taken off. If they have bearing-reins they may be seen tossing their heads incessantly, although jaded, panting, and eveloped in steam: surely the poor creatures would not thus exert themselves in a state of great fatigue, if some greater distress were not affecting them. It is the agony of the sinews under the neck and throat, which being restrained so long, ache as if a man's arm were to be kept in a painful position. Horses which have done their stage without the bearing-reins, when taken off, stand with their heads down, breathing freely, and in comparative comfort. How often upon changing horses do we see the kind horse-keeper of a stupid bearing-rein coachman instantly unbear his horses and thus entitle himself from the humane traveller to the fee which the coachman had forfeited. At the time this paper is being published, the editor has remarked that bearing-reins are more used in Bristol by coachmen, and more cruelly tightened by carmen, than in any other place in the west of England; not only by carmen plying for hire, but by the drivers of the splendid dray-horses which are to be seen in that city.

REPORT TO THE STATE BOARD OF AGRICULTURE,

ON ELIZABETH CITY COUNTY.

By Dr. R. Archer, U. S. A.

Old Point Comfort, May 31, 1842.

Mr. Edmund Ruffin. Corresponding Secretary of the Board of Agriculture of Virginia.—I give you, as far as my avocations and limited information will permit, succinct and general replies to the queries of the Board of Agriculture, so far as they relate to the county of Elizabeth City.

An inspection of the map of Virginia will show that, in a geographical point of view, our county is not surpassed by any in the state. Bounded on three sides, and intersected in various directions by navigable streams, the facilities of transportation to market, will bear a comparison with those of the most favored region of our country. From no part of the county has the farmer to cart his produce more than five miles, and in many situations the vessel anchors within a stone's throw of the barn. In three or four hours she may be in Norfolk, in 20 or 30 in Richmond, Petersburg, or Baltimore.

The average length of the county is 10 miles; the average breadth 8¾. The surface is decidedly flat; and the elevation above tide water is in few places more than 10 feet; the average elevation not more than 6 or 7 feet. It is apparent, then, that a considerable portion of the surface must be occasionally overflowed, and that our rivers and creeks must be bordered by extensive salt marshes. The ordinary rise and fall of the tide is from 2½ to 3 feet. The highest gust tide within the last twenty years, rose 4 feet above the ordinary high water mark. The highest land is on James river; from thence it slopes back to Back river, into which most of our waters fall.

The climate of Elizabeth City, in consequence of the proximity of the ocean, is very variable. East winds prevail extensively, and are always attended with chilliness and extreme dampness. In summer the sea breeze generally sets in in the afternoon, and to intensely warm mornings usually succeed cool and pleasant evenings: indeed, a sultry morning is considered a sure harbinger of a pleasant evening.

For the last five years, the mean height of the

thermometer observed at sunrise, 2 P. M. and 9 P. M., at Old Point Comfort, and the quantity of rain in inches, have been as follows:

	1837.		1838.		1839.		1840.		1841	
	Ther.	Rain.	Ther.	Rain.	Ther.	Rain.	Ther.	Rain.	Ther.	Rain.
Jan.	32	1.6	45	2.7	39	8.1	35	1.6	42	11
Feb.	38	2.5	33	1.8	43	4.7	47	3.2	39	3.2
March	45	2.4	48	2.1	48	5.3	52	4.	48	8.5
April	54	.9	55	2.8	57	3.7	61	5.9	54	6.3
May	65	2.2	64	1.1	69	5.5	68	5 9	63	4 2
June	75	3.5	75	4.5	73	4.8	74	11.1	77	3.6
July	79	2	82	2.4	80	4.5	76	13.5	78	3.6
August	77	8	81	1.2	75	14.2	79	5.5	77	8.9
Sept.	74	5.2	72	16.4	69	1.2	69	7.6	74	6.4
Oct.	64	.5	59	4.6	63	6 8	63	6.4	57	1.5
Nov.	54	2.9	48	3.7	48	3.6	50	2.8	52	2.5
Dec.	46	9	38	1.6	39	9.6	45	6.6	45	5.6
	58½	40.7	58⅓	44.9	58½	72	60	74.1	59	65.2

The climate may therefore be considered a mild one. Lettuce and cabbage plants stand the winter with slight protection, and the fig-tree rarely suffers. The live oak, though by no means a general forest tree, grows luxuriantly in many places, and appears here very nearly to have reached its northern terminus.

The soil of Elizabeth City, for the most part, consists of a light sandy loam about seven inches deep, based invariably on stiff clay. In the Back river country it contains a much smaller proportion of sand, and is consequently stiffer and more difficult to work. Extensive alluvial deposites are found in the neighborhood of most of our water courses, containing large quantities of marine shells in all stages of decomposition, imbedded in a dark rich vegetable mould, commonly called Indian banks, from the supposition that they were deposited by the Indians. Shell marl has been found at the heads of some of our creeks. One sample, that I analyzed, yielded about 65 per cent. of lime. In the Back river district no vestige of marl has been discovered, although the Indian banks are abundant. Green sand has been found on James river, a few miles above Newport's Noose. I have heard of but one experiment with it, and that did not result favorably. Nor have the experiments with marl been generally successful; from the fact, I believe, of its having been too freely used on land entirely deprived of all vegetable matter. On the farm adjoining Hampton, owned now by Mr. Jefferson Sinclair, it has been of serious disadvantage. It was applied by the former proprietor at the rate of from 250 to 500 bushels per acre. Neither corn, wheat or oats were grown upon it. Clover and Palma Christi appear to be the only crops at all capable of resisting its deleterious influence.

Your opinion, that the lands in lower Virginia are entirely devoid of calcareous matter, must be received with some modification. I have analyzed soil taken from four different parts of my farm on Hampton Roads, all high land, and found in each instance a portion of lime. This, in conjunction with the fact that marl, except in very small quantities, has invariably proved injurious when used in this neighborhood, would go far to prove that our lands in the south-east part of the county contain a fair proportion of lime. Do not understand me to say that they contain enough; for on the very fields where I found lime by analysis, I am using the Indian banks with manifest advantage, especially to the clover crop.

The following is about the average analysis I made of my soil. 440 grains of earth contained of

Water of absorption,	15 grs.
Coarse silicious sand and gravel,	8
Undecomposed vegetable fibre,	1
Fine silicious sand,	353
Calcareous sand,	5
Carbonate of lime,	4
Vegetable matter destructible by heat,	7
Silica,	27
Alumina,	7
Vegetable and animal extract,	3
A trace of magnesia.	
Loss,	10
	440

Our water is good and abundant. We have springs, but our supply is usually derived from wells. We have rarely to dig more than ten feet. In summer our out cattle frequently suffer for want of water; there is no excuse for this, as it could be so easily remedied by sinking wells in the neighborhood of their ranges. But in lieu of these, we resort to water holes scooped out to receive the rain water, that at certain seasons covers our woods. This supply in course of time becomes stagnant and putrid, and ultimately dries up.

In this county we may safely say, that we suffer more from wet than drought.

Where water-power is used for manufacturing purposes, we rely exclusively on the tide-water, by damming up the heads of creeks. In this way we get a small fall, which enables the miller to grind about fifteen hours out of 24, on both the flood and ebb tides. Mr. Dubre has on Back river a mill on this construction which grinds excellent meal and flour.

We have no mill ponds in the county. There was a few years past, a very extensive one on the county road leading to Yorktown, but the property has recently fallen into the hands of Mr. William McClain, who proposes to convert it into an artificial meadow. He has already expended a large sum in tide gates, ditching and embankments, and is sanguine of success. This will be a most important improvement, as it will at once break up a hot-bed of deadly malaria.

The proportion of cleared to uncleared land I have no correct means of knowing, but we have estimated as follows: two-fifths in arable land, one-tenth in waste land, and the remainder in woods.

A large portion of the wood land is covered with a second growth of pine, having been once under cultivation and turned out.

Very little has been done in the way of artificial meadows, and our natural meadows consist chiefly of salt marsh. These afford extensive and luxuriant grazing, and in some situations the cattle are raised exclusively upon them, having never tasted a grain of corn, or blade of fodder.

The amount of hay cured is very limited; none is offered for sale, and I presume not more than 50 acres are annually mowed. This is the more surprising, as all the artificial grasses thrive

perfectly well here, and the Back river country seems peculiarly adapted to them. At Brierfield, on James river, Mr. Bartle has been making hay for 15 or 16 years. Mr. Andrew McClean continues the system, and thus supplies the principal provender for a large stock of horses and cattle. The great obstacle to the successful cultivation of artificial grasses here appears to be the rapidity with which weeds and the natural grasses grow; but this I have no doubt can in a great degree be remedied by cleansing the land by proper tillage and thick sowing: to use grass seed sparingly is to throw it away, and lose the use of your land besides.

The use of clover is extending rapidly, and few farmers of any intelligence entirely dispense with it. Twenty years ago it was unknown as a field crop; now the clover field is as extensive as the wheat or oat field, but it is grazed and turned in for wheat.

Our farms are generally small, varying from 100 to 800 acres, average about 200. The old three-shift system is still the prevailing one. Many have adopted the four-shift, as they find they cannot enjoy the full benefit of the clover fallow with the old rotation. I prefer the four-shift; and my rotation is corn, oats, clover, wheat.

Corn, wheat and oats are our staple; no tobacco is raised. A few years since the Palma Christi was extensively cultivated, but it is found to be an expensive crop, and is now almost totally abandoned. The farmer who raises this crop, usually has to buy his corn and fodder; and the condition of his stock in the spring speaks a language which cannot be misunderstood. It is a great exhauster and returns nothing to the land.

The cultivation of the sweet potato has been considerably extended within the last three years, and promised to become a profitable crop; the losses, however, sustained last year, from not meeting with the expected demand from the north, have deterred many this year from prosecuting the culture. The farmer, however, has this consolation, if he cannot sell them, he can feed them to his hogs, and, next to corn, I know of nothing he could raise to more advantage for them.

The mode of culture here is as follows:

Prepare a rich bed with unfermented stable manure, in a dry situation, and as early as possible in the spring; when all danger from frost has passed, lay the slips or small potatoes side by side all over the bed, and cover them about an inch deep by sifting rich mould over them. Leave them to sprout.

Having thoroughly manured your land, which should be the lightest and poorest you have, break it up well and drag; cross plough it and drag it again and again, until you get it well pulverized; list it by throwing two or three furrows together with a small plough, leaving the ridges or lists two and a half or three feet apart; run a garden rake lengthwise over the ridges to level the tops and rake off the clods. The land is now ready for planting.

When your potato sprouts are three or four inches high, pick them out of the bed by pulling them up with one hand, whilst with the other you prevent the displacement of the potato by pressing on it. Set them out with a dibble as you do cabbage plants, from 18 to 20 inches apart. Keep them clear of grass with the hoe; reset where they are missing; run the cultivator through the middles, and when the plants are of sufficient size and have commenced running freely, throw a furrow from the middles to the bed on each side. A boy should follow after the plough to uncover the vines. This completes the cultivation, and in a short time the ground is completely covered. The vines throw out small roots from each joint, which immediately take hold of the earth: it is thought best to break this connexion, and it is recommended to go after a rain with a rake or crooked stick and pull them up in the middles.

The crop is harvested by throwing down the beds on each side with a plough, taking out the potatoes with the hand or a hoe, or throwing them out by a third bout of the plough. They are then assorted, and the smallest reserved for seed for the next year, although the slips are generally preferred. These are made by cuttings from the vine 12 or 18 inches long, covered up in the ground, leaving one or both ends out, and worked as the general crop is.

The great art in preserving the potatoes or slips through the winter, consists in putting them away in good order. If they are bruised or skinned they will invariably rot. They should be handled as little as possible, and it is therefore best to take them directly from the field in baskets and place them where they are to remain through the winter: have no second or third handling. A warm dry cellar is the best place to keep them in. Make a good bed of pine leaves, lay the potatoes on it in a pile; let them remain so with the door or window open, to undergo their sweat; and when the season is so far advanced as to threaten frost, cover them well with pine leaves and close the doors and windows tight. Occasionally, during the winter, when the weather is fine and warm, you may admit the air and sun for a short time, to carry off any dampness that may have collected in the cellar.

In the cultivation of our staple crops almost every farmer has his own peculiar fancy. In the corn crop, the plough, and more especially the hoe, are much less used than formerly. The harrow and cultivator accomplish the principal part of the work. Few think of hoeing their corn more than once, and some dispense with it altogether. Their answer is, "they can't afford to use the hoe." The public works have so enhanced the price of labor in this neighborhood, that a much smaller farm force is used than formerly. I am of opinion it might still be reduced to advantage. We cultivate too much land: if we would throw out one half of our fields to rest, under a cover of clover and other grasses, we might dispense with one half of our laboring force of negroes and horses; and in two or three years the one half would produce more than the whole did before.

We usually plough about four inches deep. Some of our old-fashioned farmers still go on the scratching system, for fear of turning under the rich top soil; but deep ploughing is becoming decidedly the fashion. On our light lands the ground is broken up flat in the spring for corn, which is planted as soon thereafter as practicable, say from the first to the tenth of April. On Back river, where the lands are stiff and wet, this system would be impracticable; they plough as early

in the winter as they can, throwing up the land in beds, and replough in the spring.

On good land the twin corn is preferred to all others.

Most of our wheat is sown on corn land at the rate of about three pecks to the acre; few farmers exceed a bushel. The advantage of the fallow system, however, is gradually developing itself, and we estimate the product on fallow land at one-third more than on corn land. This is not to be ascribed entirely to the improved condition of the soil, but measurably to the opportunity it affords for early seeding, and the better preparation of the land. We usually sow the bearded golden chaff.

When the land will allow, that is, where it is not liable to suffer from standing water, we prefer the flat tillage; wherein it is thrown up in beds about five feet wide for corn, and ten or twenty for oats or wheat.

Our average product per acre throughout the county may be estimated at 25 bushels of corn, 10 of wheat, 20 of oats, and 150 of sweet potatoes.

Ruta baga turnips have been extensively cultivated by some of our farmers, but generally our patches do not exceed an acre. We sow about the first of July; the land being well manured, thoroughly ploughed, harrowed and listed; the lists or ridges flattened by running a light harrow over them. We leave the plants about 12 or 14 inches apart on the ridges. The principal work is effected with a narrow cultivator, and when the plants are of sufficient size to receive the dirt, a furrow from the plough is thrown to them from each side. This completes the cultivation.

On a small scale every farmer might cultivate the ruta baga or mangel wurtzel beet to advantage, because they would not interfere materially with his general crop, and are certainly a very agreeable change of food to his stock in the winter; but I doubt whether it would be profitable to go largely into their culture. They are a troublesome and rather uncertain crop, consuming an immense quantity of manure, and, withal, yielding but little nutriment. According to Sir Humphry Davy, 1000 parts of ruta baga yield but 64 parts of nutritive matter, whilst the Irish potato yields 200. One bushel of potatoes, then, is worth three bushels of turnips; and an acre of potatoes is cultivated at less than one half the labor required for an acre of turnips. Mangel wurtzel yields about 148 parts in a thousand, but they occupy the ground from March to October, and consequently require a great deal of labor.

Our principal implements consist of the cast-iron mould-board plough, the cultivator and harrow. Of ploughs we have many varieties, but the Freeborn is in most general use. I have used Chenniworth's self-sharpening plough for three years past, and am highly pleased with it. Prouty and Mear's premium plough was introduced with a loud flourish of trumpets last year, but proves to be worthless: it will do good work in very clean land, but choke immediately where there is grass. It is moreover very expensive: one for a single horse, sent to me from Boston, cost, delivered here, upwards of $8. Davis' plough is highly recommended by all who use it; it does excellent work, and is little liable to choke.

It is very important that a farmer should adopt one particular variety of plough. The advantage is manifest, for then the parts of one will fit another, and a broken plough can at any time be repaired by the fragments of another. This rule should not be confined to ploughs, but should extend to carts, wheels and axles.

The use of the roller is gradually extending through our county. I have found it an invaluable implement, peculiarly adapted to our light soils. I usually plough in my wheat and oats; if the land is very rough, I run a harrow over them and follow with the roller, but generally the harrow is dispensed with. The roller leaves the land in beautiful order for the scythe.

Thrashing machines of various patterns are in use with us. Parker's is highly spoken of. I prefer Sinclair and Moore's horse-power to any I have seen. They all work well if well managed, but in the hands of careless negroes and overseers are good for nothing. Upon the whole, I think the small farmer had as well dispense with them; he can tread out his two or three hundred bushels of wheat in four or five days, and with a small machine he can do no better. A new corn and cob crusher has been recently introduced by two or three of our farmers. They speak in the highest terms of it as performing all that was promised by the patentee. The cob is crushed by passing through iron cylinders.

Our fences are usually made of pine rails. When convenient, oak is used. In the James river district chestnut is found, and is of course preferred to any thing else. We have no stone, and there is not a live fence or hedge in the county.

Our cattle and hogs are improving. The Durham and Devon stocks have been introduced with decided advantage. The Berkshire hog is highly lauded by many, whilst others contend that the same care bestowed upon our native stock would make them equal to the Berkshire. Two gentlemen who purchased a boar and sow each from Bement, after getting one or two farrows, have sold out, considering them worthless, and are breeding now in preference from the New Jersey grass hog. On the other hand, a gentleman on Back river, who purchased from Lossing, says there is no comparison between his Berkshires and any other hog he ever saw. The fact is, there are no doubt good as well as bad Berkshires, and a bad Berkshire is very little, if any better, than any other bad hog. The hog mania, however, has had the effect of attracting the farmers' attention to the subject; and in that way, I believe, more than by the introduction of any new breed, have our hogs been improved. We feed better than we did two or three years ago.

Horses are chiefly used for the labor of the farm: a few prefer mules, and you may occasionally see a yoke of oxen attached to the plough. We raise no stock for exportation.

Of dairy management I can say nothing. Very little butter is made beyond the requirements of the farmer's family. The time however is not distant when this will form an important branch of our agriculture. The lands on Back river are peculiarly fitted for pasturage; they are covered with white clover, and the increasing demand for butter will ere long effect a change in that region. The prevailing growth upon our wood lands is oak, hickory, pine, gum, elm, walnut, locust, maple, sycamore, beech and chestnut. The chestnut is confined to that region of country bordering on James river.

Our wood lands afford good ranges for our cattle and hogs during nine months of the year. In mild winters they can subsist on them, and keep in pretty good plight without any other food.

Some pine wood is cut for the northern market, but in no great quantity.

Under the head of "obstacles to improvement" I will enumerate, first, *the facility of living without labor*. Experience shows that, in this country, if not in all others, the improvements in agriculture are in the inverse ratio of the facilities of procuring subsistence. Perhaps in no part of the state are these facilities greater than here. With fish and oysters at our very doors, a man can in one hour catch enough to subsist a family a whole day. The great mass of population in all countries labor almost solely for subsistence: the fear of starvation is the strong incentive to exertion; here that incentive is unknown, and unless a man looks forward to a higher destiny than that of a mere fisherman, he will be content to live from day to day at the smallest expense of bodily labor. This is unfortunately the case with the great body of the lower class of our white population. It is unproductive labor, and returns nothing to the common stock, but rather takes from it; for in time this fisherman dies, leaving his wife and children a legacy to the public charity. The labor of the county is taxed to support the family of a man who never contributed one cent to the revenue; the children are brought up in ignorance and idleness, and as soon as they are large enough, follow in the footsteps of their illustrious progenitor: and thus they move in a circle, the fourth generation no farther advanced in refinement, education or morals, than their great grandfather. It is this state of things, coupled with our injudicious system of public charity, that has brought our poor rates to 75 cents a year on each tithable.

But this aversion to labor is not confined to the lower class; it unfortunately pervades the higher, and grows out of the fact, that it is in some way considered disreputable, because it is the province of the negro. The consequence is, that many become poorer just in proportion as their families increase. Their half dozen negroes and worn-out fields afford them a living; but they get married, and in a few years have half a dozen children, all to be supported by the same negroes and worn-out fields, which are daily getting poorer. Thus no money is saved for improvement, every inch of the farm is urged to the utmost, and they either descend to the fisherman state, or, if too proud for that, sell out and move to the west, that golden region where people can live without working.

The *law of enclosures*. So much has been said and written on this subject, that it is hardly necessary to do more than to enumerate it as one of the obstacles to improvement. The time which ought to be devoted to manuring and improvement, is employed in making and repairing fences; not so much for the protection of our crops against our own cattle, as against those of others, who most frequently have no crops of their own to protect. If you cut down a worthless tree on my land, the law considers you guilty of a trespass, and you pay the penalty; if your horse or cow break into my field and destroy my corn, you have only to prove that my fence was one rail below the legal height, and I have no redress.

The *road law* operates injuriously, because it operates unequally and expensively. The county is laid off into districts, and an overseer appointed for each. He receives generally about one dollar a day for the time employed in supervising the hands on the road. This at once is a temptation with many to prolong the work to the utmost. He can summon all the labor of his district, whenever it may suit his personal convenience, without consulting that of any one else, or even if he were disposed to do so, a convenient time with one might be a very inconvenient time with another. If the road is any distance from home, the party rarely gets to work before 9 o'clock, and then they are knocked off an hour or two before sunset, as the overseer wants to get home. The hands are badly provided with tools; sometimes all hoes when spades or axes are required; then again spades or axes, and a scarcity of hoes; and thus one half are frequently idle for want of proper tools. Sometimes the whole force of his district, amounting to 30 or 40 hands, is required to mend a bridge or fill up a hole, that might be done by 3 or 4. He is afraid he might be accused of partiality, if he summoned Mr. A's negroes and not Mr. B's, and so calls all out, and here is a hole filled up at the cost of thirty or forty days' labor, when only three or four were required. The balance is of course so much dead loss to the production of the county.

It seems to me the object could be much better effected by imposing a moderate tax in money, as it is usually done in the northern states.

"Granting licenses to tippling shops, and non-enforcement of the law against those who sell spirits without license." This is a serious evil to our county. It exercises a baneful influence, not only on our negroes, but the lower class of our white population. They are tempted to drink, and having no money, pay perhaps four times as much for the indulgence, in stolen property, as the money value of the whisky. Nine-tenths of the petty larcenies committed here can be traced to the influence of the grog-shops.

REMARKS ON SOME OF THE CHEMICAL CHANGES PRODUCED IN THE DIFFERENT MODES OF PREPARING ANIMAL MANURES.

To the Editor of the Farmers' Register.

Tuscaloosa, Ala., June 17, 1842.

Sir:—I have just read, in the last (May) number of the Register, an article on urine, from "Squarey's Treatise on Agricultural Chemistry." It begins with an extract from "Liebig's Organic Chemistry of Agriculture and Physiology;" and is, indeed, a pretty correct abstract of an important and interesting portion of that very valuable work.

There are, however, two paragraphs, in which Squarey recommends a mode of employing urine, which Liebig condemns as "the most injudicious that could be conceived." As Squarey professes to adopt and recommend the principles so ably developed by Liebig—as those principles, if true, must, says Professor Lindley, "be the foundation of all exact and economical methods of cultivation"—and as their truth can only be established by the results of numerous experiments,

performed in exact accordance with the views of their author—I have concluded to direct your attention to what I conceive to be an important error in Squarey's Treatise. He says,

"Another compost heap, which would answer admirably for any purpose almost for which a manure can be required, that is, either as a stimulant for turnips, as a pabulum for wheat, or white crops —or, again, as a top-dressing for either of the above, or for grass—may be readily formed by mixing long stable litter, in which decay has already commenced, with the burnt ashes of vegetables or wood, in somewhat indefinite portions; taking care, however, that the litter should predominate, and then pouring over the heap daily a portion of the putrid urine, and stirring the mass well up together.

"In this heap the ammonia of the urine would be decomposed; but the nitrogen, the vivifying principle of the ammonia, would unite with the alkaline matter, the soda or potash of the burnt vegetable ashes, to form nitrate of potash or soda: the hydrogen, the other constituent of ammonia, being given off."

In such a heap, the carbonate of ammonia, resulting chiefly from the decomposition of the urea of the putrefying urine, would be decomposed and lost. The nitrogen of the ammonia would, by combining with oxygen of the air, form nitric acid, which, by uniting with potassa, lime, alumina, &c., would give rise to various soluble nitrates. The manure so formed would be very valuable; but its action as a fertilizer would depend, not on the nitrates, if Liebig's opinions are correct, but on the phosphates and other salts, which, in such a heap, would escape decomposition, and which are very valuable ingredients of soils. Indeed, Squarey admits that the ammonia of the urine would be decomposed; and any one, who has attentively read Liebig's work, must be aware, that he ascribes much of the efficacy of urine as a manure, to its ammoniacal salts, and attaches no importance to nitrates, even in the culture of plants, part of which contain nitrates.

"Ammonia, (says Liebig—Webster's edition, 1841, p. 138,) by its transformation, furnishes nitric acid to the tobacco plant, sun-flower, chenopodium, and borago officinalis, when they grow in a soil completely free from nitre, (nitrate of potash.) Nitrates are necessary constituents of these plants, which thrive only where *ammonia* is present in large quantity, and where they are also subject to the influence of the direct rays of the sun, an influence necessary to effect the disengagement, within their stems and leaves, of the oxygen, which shall unite with the nitrogen of the ammonia to form nitric acid."

Hence it appears, that Liebig believes the conversion of ammonia into nitric acid, to be in such plants as tobacco an essential process of assimilation. If this be true, (and Squarey says "the powerful influence of urine must consist in its ammoniacal salts,") the process recommended by him must deprive the urine of its most abundant and most valuable ingredient. And if the nitrates, found in plants, are products of processes of assimilation, such salts, presented ready formed to their roots, can have no good effect, and may have a bad one. At all events, it has been ascertained that such plants grow well in soils which do not contain nitre.

I am aware that Squarey's, or a similar mode of employing urine, is recommended by some scientific men, and that it is practised successfully "in the vicinity of some of the large cities of the United States." This, however, does not prove that it is the best mode of employing urine. Scientific men have devoted very little time to the investigation of the subject; for, as Liebig remarks, "since the time of the immortal author of the 'Agricultural Chemistry,' no chemist has occupied himself in studying the applications of chemical principles to the growth of vegetables." And the practice of our most intelligent agriculturists is often erroneous; and the apparent success of that which I am now opposing, proves only, what every chemist, acquainted with the nature and number of the salts of urine, would expect, that it is a valuable manure, when deprived of that ingredient, which is most fertilizing, and of which it contains the largest quantity.

Liebig describes several modes of preparing manure from human and animal excrements, both fluid and solid, which he characterizes as "the most injudicious which could be conceived." And the principle of Squarey's method is expressly condemned.

"In other manufactories of manure, the excrements while soft are mixed with the *ashes of wood*, or with earth, both of which substances contain a large amount of caustic lime, by means of which a complete expression of their ammonia is effected, and they are completely deprived of smell. But such a residue can act only by the phosphates which it still contains, for all the ammoniacal salts have been decomposed, and their ammonia expelled." (*Webster's edition*, 1841, p. 243.)

It would, therefore, be much better to employ wood ashes, lime, and other alkaline substances, in the way recommended by Liebig, which is to scatter them over the surface of the soil, exactly as the planter sows wheat or oats; for though these alkaline substances are valuable manures, they all have a greater or less tendency to decompose ammoniacal salts, and to expel their volatile alkali, ammonia. It is however an advantage, where the soil contains a proper mixture of alkaline substances; for the ammoniacal salts of the manures, formed from animal excrements, coming gradually into contact with them, are slowly decomposed during the growth of the crop, and the ammonia, while in a nascent state, is presented to the rootlets of the plants, in the best possible form for absorption. This is the mode that has, for years, been adopted with so much success in Scotland; and the practice of that nation is in exact accordance with the views of Liebig.

There is not, it appears to me, any way in which ashes, lime, or other alkaline substances, can be economically applied to compost heaps formed of animal excrements. Gypsum, copperas, or some other similar salt, which readily yields its acid to ammonia, should be spread over the heap and mixed with it; or sulphuric acid, very much diluted with water, should be mixed with the liquid excrements, before they are poured on it; or it should be mixed with burnt clay, ashes of coal, pulverized charcoal, or some other substance which has a powerful affinity for ammonia; or it should contain so much litter as to absorb most of the putrid urine, and thereby pre-

vent the escape of most of the ammonia. In all cases, the heap should be protected from rain, by a good shelter. R. T. B.

STALL-FEEDING.

Directions to stall-feed Cattle—read before "The Philadelphia Society for promoting Agriculture," June 1, 1842, by James Mease, M. D., Vice President.

From the Philadelphia Saturday Courier.

1. The subjects on which it is intended to lay an extra proportion of fat must be in good condition when put up—otherwise they will not pay for the cost, feed, and care.

2. Give one handful of fine salt three times weekly to each beast.

3. The hay must be of the first cutting, (if clover) and well cured—that is, not left before cutting, in the field, until the stems are deprived of all nutritious moisture, the leaves and blossoms turned black, and when cut, turned day after day in making, until they fall off from age, and exposure to the sun, and probably a rain or two. These consequences (the last excepted) are the invariable result of sowing timothy with clover seed, for the first grass does not attain its full growth until two weeks after the latter is fully ripe, and farmers almost always refuse to cut the crop until the timothy is fit to mow. The union of orchard grass with clover does not admit of the objections to which the first combination is liable, for both progress equally to maturity, and if cut when in full blossom, and not kept too long in the field, make a hay which cannot be exceeded. Hay should be given thrice daily, and no more put in the rack at a time, than the animals will eat before their next allowance, as they become fastidious by confinement, and will refuse hay upon which they have often breathed, and which is also impregnated with the confined air of the stable. At night, enough must be given to last until the morning, and the remains of the former supply at all times taken away, to give place to a fresh one.

4. Water is to be given twice a day, and, if convenient, the animals may be walked to the spring, creek, or pump. The exercise will amuse them, promote their appetites, and aid of course the object in view.

5. After their hay is eaten, give from 10 to 16 quarts of Indian corn and oats ground together, to each head three times daily during ten days; then half a peck of boiled mashed potatoes, with a handful of corn meal sprinkled over them. The water in which the potatoes have been boiled must be thrown away, as I know it to be hurtful to animals. In a week, a change may be made of chopped pumpkins, or sliced Swedish turnips, or sugar beet, for the potatoes. The new food will invariably encourage appetite, unless in the event of an aversion to some one article, for which no cause can be assigned. Indian corn meal, with or without oats, must be the never-failing accompaniment of any other food.

6. Great care must be taken to watch the appetite of the animal, so as never to cloy it; otherwise time will be lost. He must on no account be over-fed—and to avoid this, during the occurrence of an increase of temperature in the air, (or "*a warm spell*,") which takes place almost every winter, the usual allowance must be diminished. The farmer should take the alarm the hour that he sees the animal leave any of his usual allowance in the trough or rack, clean out both, and by a daily walk, extra carding, and, if necessary, a dose of Glauber salts, try to restore the appetite.

7. The food, other than hay, should be given in a box and in the trough alternately, which should be daily washed or dry-scrubbed, and scraped, to prevent the remains of a former mess from turning sour, which will infallibly disgust the ox. This was the uniform practice of that first-rate farmer, Joseph Cooper, of New Jersey, who urged its adoption upon the writer, as one with the importance of which his own ample experience had fully impressed him.

8. Flax-seed jelly, with corn meal, is of service occasionally to soften and loosen the skin, and produce that "kindly feel" in it which the great English improver, Bakewell, ranked as an essential point in the choice and feeding of cattle; meaning thereby a "mellow, soft feel, yet firm to the touch, and which is equally distant from the hard dry skin peculiar to some cattle, as it is from the loose and flabby feel of others."

9. Carding the animal thrice daily with appropriate cards is an all-essential part of the process. The operation is highly grateful to the animal, and its effects eminently salutary. It promotes the action of the small vessels on the surface, and the muscular fibres, which sympathise and act indirectly upon the stomach. Medical men are well acquainted with the intimate connexion subsisting between the state of the human corporeal surface, and the stomach and viscera connected with digestion, and the same connexion is observed in the ox when feeding.

10. Regularity in the hours of feeding and watering is essential.

11. Cut straw, free from mould or smell, may be given once a day, by way of a change, slightly sprinkled with corn meal and salt. It will be eaten freely. The stable should be fully ventilated, if possible—for the more pure the air, the more keenly will the animals eat.' The utmost attention must also be paid to cleanliness. The animals must not be permitted, when leaving the stall to drink, to walk through a yard covered with wet manure, and to return to their stalls with the clefts of their feet filled therewith—for, owing to the acrimony of the liquid a sore therein will be the almost certain effect, with a consequent loss of appetite. This cleft must be occasionally examined in both oxen and sheep, and if found sore, should be washed with soap and water, when the application of a dossil of tow, dipped in spirits of turpentine, morning and evening, for three or four days, will remove it.

12. Clean bedding is a point obvious to all.

TAMING HORSES—HORSE TRAINING.

By A. J. Ellis, B. A., Windsor, Oxley.

From an English Paper.

Mr. Catlin, in his work on the manners and customs of the North American Indians, gave the following account of their method of taming the wild buffalo calves, and wild horses:—

"I have often, in concurrence with a well-known custom of the country, held my hand over the eyes of the calf, and breathed a few strong breaths into its nostrils; after which I have, with my companions, rode several miles into our encampment, with the little prisoner busily following the heels of my horse the whole way as close and affectionately as its instinct would attach it to the company of its dam. This is one the most extraordinary things that I have met with in the habits of this wild country; and although I have often heard of it, and felt unable exactly to believe it, I am now willing to bear testimony to the fact, from the numerous instances which I have witnessed since I came into the country. During the time that I resided at this point, in the spring of the year, on my way up the river, I assisted (in numerous hunts of the buffalo, with the Fur Company's men) in bringing in, in the above manner, several of these little prisoners, which sometimes follow for five or six miles close to our horses' heels, and even into the Fur Company's fort, and into the stable where our horses are led. In this way, before I left for the head waters of the Missouri, I think we had collected about a dozen."

In the same way the wild horses are tamed. When the Indian has got him well secured with the lasso, and a pair of hobbles on his feet, "he gradually advances until he is able to place his hand on the animal's nose, over his eyes, and at length to breathe in its nostrils, when it soon becomes docile and conquered; so that he has little more to do than to remove the hobbles from his feet, and ride it into the camp."

Mr. Ellis chanced to read this account when on a visit in Yorkshire, and forsooth resolved to try the experiment. He and his friends were alike incredulous, and sought amusement from the failure rather than knowledge by the result—but two experiments, all he was able to try, were both successful. Here are the particulars of one of them:—

"Saturday, February 12, 1842.—While the last experiments were being tried on the yearling, W. espied B., a farmer and tenants, with some men, at the distance of some fields, trying, most ineffectually, on the old system, to break a horse. W. proposed to go down and show him what effect had been produced on the yearling. When the party arrived at the spot they found that B. and his men had tied their filly short up to a tree in the corner of a field, one side of which was walled, and the other hedged in. W. now proposed to B. to tame his horse after the new method. B., who was aware of the character of his horse, anxiously warned W. not to approach it, cautioning him especially against his fore feet, asserting that the horse would rear and strike him with the fore feet, as it had 'lamed' his own (B.'s) thigh just before they had come up. W. therefore proceeded very cautiously. He climbed the wall, and came at the horse through the tree, to the trunk of which he clung for some time, that he might secure a retreat in case of need. Immediately upon his touching the halter, the horse pranced about, and finally pulled away with a dogged and stubborn expression, which seemed to bid W. defiance. Taking advantage of this W. leaned over as far as he could, clinging all the time to the tree with his right hand, and succeeded in breathing in one nostril, without, however, being able to blind the eyes. From that moment all became easy. W., who is very skilful in the management of a horse, coaxed it, and rubbed its face, and breathed from time to time into the nostrils, while the horse offered no resistance. In about ten minutes W. declared his conviction that the horse was subdued; and he then unfastened it, and, to the great and evident astonishment of B., who had been trying all the morning in vain to get over it, led it quietly away with a loose halter. Stopping in the middle of the field, with no one else near, W. quietly walked up to the horse, placed his arm over one eye, and his hand over the other, and breathed in the nostrils. It was pleasing to observe how agreeable this operation appeared to the horse, who put up his nose to receive the puff. In this manner W. led the horse through all the fields to the stable yard, where he examined the fore feet of the horse, who offered no resistance, but while W. was examining the hind feet, bent its neck round, and kept nosing W's back. He next buckled on a surcingle, and then a saddle, and finally fitted the horse with a rope. During the whole of these operations the horse did not offer the slightest resistance, nor did it flinch in the least degree."

Two experiments are all Mr. Ellis has had opportunity of either witnessing, or hearing the results of. But, as he states, these have been to him perfectly satisfactory; and, as he has no opportunity of carrying them on, since he is unacquainted with the treatment of horses, and neither owns any, nor is likely to be thrown in the way of unbroken colts, he has resolved to publish these particulars, that gentlemen, farmers, trainers, and others, may at least try so simple a plan, and thus test and determine its value. Mr. Ellis is of opinion that this is the secret of the celebrated Irish horse tamers; and we remember that in more than one recorded instance of their power, they pretended to whisper to the animal, and played with his head, and thus probably breathed in his nostrils.

SCIENCE AND AGRICULTURE.

Extracts from a Review of Johnston's Lectures on Agricultural Chemistry and Geology.

From Blackwood's Magazine, for June, 1842.

The atmosphere consists chiefly of hydrogen and nitrogen, but contains also a very small proportion of carbonic acid—one gallon in two thousand five hundred. This carbonic acid consists of oxygen and carbon only—it is the gas that escapes from soda water and sparkling champagne. The leaves and other green parts of plants, in the sunshine, absorb it from the air, decompose it, as chemists call the process, returning the oxygen to the atmosphere, and retaining the carbon. Plants thus clearly obtain carbon from the air, and in larger quantity in proportion to the extent of leaf they hang out, and to the duration of the sunshine. But the earth also contains vegetable matter, from which the roots draw part of their sustenance—of their carbon, that is—in the form of certain soluble organic compounds, which are naturally produced during the decay

of vegetable and animal substances. But here physiologists and chemists are at real or apparent variance with each other, in regard to the amount of carbon which plants derive from the soil. The old physiologists, and some of the less instructed of the existing race, seeing that soils rich in vegetable matter gave generally luxuriant crops, that by adding vegetable and animal manures to these soils they were rendered still more productive, and that the quantity of carbonic acid in the atmosphere was so very small—have generally advanced and maintained the opinion that the sustenance of plants—their carbon—is chiefly derived from the soil—that what they draw from the air forms but a small portion of their actual substance. This opinion has been subjected by its defenders to strange twistings and stretchings, to account for such facts as these. A field almost destitute of vegetable matter is laid down to grass, when year by year, though depastured all the while, the vegetable matter increases, till at length four or six inches of rich, dark, vegetable mould are formed upon its surface. Or a waste is planted with trees, which every succeeding autumn shed their leaves on the surface, and though much is carried off in thinnings, and the entire forest is sent to market when the trees are of sufficient size, yet the soil contains more vegetable matter at the end of all this, than it did at the beginning. Or a tree falls across a stream, dams up the water, and produces a marshy spot, rushes and weeds spring up, mosses take root and grow, year after year new shoots are sent forth and die, vegetable matter accumulates, a bog, and finally a thick bed of peat is formed. Physiologists of the old school may doubt, but common sense tells us that the increase of vegetable matter in all these cases—of its carbon, that is —must have been derived from the air.

This conclusion does not imply that a given plant or crop, that the individual grasses, or trees, or mosses, in our three cases, have not each derived a portion of their sustenance from the soil. The roots of our trees, for example, are continually drawing soluble organic matter from the soil, which they send up to the branches and leaves. But the quantity they return to it in the leaves they shed, and in the roots themselves, which remain buried, is something greater than what they thus send up; and thus the organic matter slowly increases. In our arable lands the same is shown by the slow decrease of vegetable matter through prolonged culture, and the consequent necessity of either adding a fresh supply of organic matter to maintain their fertility, or of leaving them for a time to a process of natural recovery. Still the question remains undecided between the two parties—what portion of their carbon do plants thus derive from the soil, and what from the air? It appears that *borage* has been long grown in Germany, for the purpose of ploughing in as a green manure. Nearly twenty years ago Lampadius, who has done much good service to scientific agriculture, made an experiment with the view of determining the amount of vegetable matter with which this plant was capable of enriching the soil. This experiment led him to the conclusion that borage draws no less than *nine-tenths* of its carbon from the air. Much, however, must depend upon the climate and soil; and later experiments have shown that the crops we usually cultivate for food derive, on an average, about two-thirds of their carbon from the air, and, consequently that, if we add to the soil, in the form of manure, one-third of what we take off in the form of a crop, we should maintain it in its existing state of richness, in so far as this depends upon vegetable matter, were there not other causes in operation which tend to lessen the amount of organic matter in soils that are continually turned up by the plough. Our author thus concludes his review of this question:—

"Being thus fitted by nature to draw their sustenance—now from the earth, now from the air, and now from both, according as they can most readily obtain it—plants are capable of living—though rarely a robust life—at the expense of either. The proportion of their food which they actually derive from each source, will depend upon many circumstances—on the nature of the plant itself—on the period of its growth—on the soil in which it is planted—on the abundance of food presented to either extremity—on the warmth and moisture of the climate—on the duration and intensity of the sunshine, and upon other circumstances of a similar kind—so that the only general law seems to be, that, like animals, plants have also the power of adapting themselves to a certain extent, to the conditions in which they are placed; and of supporting life by the aid of such sustenance as may be within their reach.

"Such a view of the course of nature in the vegetable kingdom is consistent, I believe, with all known facts. And that the Deity has bountifully fitted the various orders of plants—with which the surface of the earth is at once beautified and rendered capable of supporting animal life—to draw their nourishment, in some spots more from the air, in others more from the soil, is only in accordance with the numerous provisions we every where perceive, for the preservation and continuance of the present condition of things."

Another point in connexion with the organic food of plants, and especially the source of their carbon, has recently been brought into perhaps unnatural prominence by Liebig. The physiologists, believing that plants derived from the soil by far the greatest proportion of their carbon, naturally inquired what vegetable substances in the soil entered into their roots and ministered in the greatest degree to their growth. To vegetable matter, generally, they gave the name of *humus*, and to a dark brown substance which dissolves out of the soil, when it is boiled with a solution of common soda, the name of *humic acid* was applied. This humic acid being often met with in considerable quantities in fertile soils, has been generally mentioned by foreign agricultural writers as the principal source of that portion of the carbon which plants derive from the soil. It will be observed that this opinion may be entertained, without denying, at the same time, that plants derive the *largest* portion of their sustenance from the carbonic acid of the atmosphere. Liebig has shown that the humic acid and its earthy compounds are so sparingly soluble, that, were all the water which enters the roots of plants to carry with it as much of them as it could hold in solution, it would still convey to the stem and branches only a small fraction of the carbon they contain. So far Liebig's argument is unassail-

able; but there is a great gulf, as it appears to us, betwixt the obvious conclusion from this—that humic acid, namely, and its *earthy* salts, can contribute but *little* to the general nourishment of plants, and that which he affects to draw from it—that humic acid in no *other* way can directly contribute to the nourishment of plants, and that the only use of the entire vegetable matter in the soil is, by its decay, to yield carbonic acid to the roots. The compounds of humic acid, with potash, soda, and ammonia, are very soluble in water, and it has yet to be proved that they may not, especially in manured land, be present in the soil, and be thence taken up by the roots, while it is certain, also, that other soluble organic substances do exist about the roots, which, therefore, may enter into the circulation of the plant and aid its growth. In philosophical questions, a distinct line should be drawn between clearly established facts, or conclusions legitimately formed from them, and the mere opinions even of the most eminent men. On the whole, we are inclined to hold a middle way, and with our author to consider it to be satisfactorily established, that, while a plant sucks in by its leaves and roots much carbon, in the form of carbonic acid, it derives a *variable* portion of its immediate sustenance (of its carbon) from the soluble organic substances that are within reach of its roots.

This fact is never doubted by the practical husbandman. It forms the basis of many of his daily and most important operations, while the results of these operations are further proofs of the fact.

We pass on to another important question connected with the food of plants, in regard to which the views of our author differ to some extent from another of those opinions propounded in so broad and general a manner in the recent work of Liebig. We allude to the source of the nitrogen of plants. There are two compounds from which, according to our author, there is reason to suppose that plants, in the general vegetation of the globe, derive the greatest proportion of their nitrogen. These compounds are *ammonia*, which consists of nitrogen and hydrogen; and *nitric acid*, which is composed of nitrogen and oxygen only. The beneficial action of ammonia upon vegetation has been long recognized in practice, experimented upon by philosophical agriculturists, and brought prominently forward by writers upon theoretical and practical agriculture. It is given off in the gaseous state during the decay of the bodies and excretions of animals; and therefore wherever such are added, intentionally or otherwise, to the soil, the ammonia they yield must be considered as the source of a portion of the nitrogen which the plants that grow there are found to contain. In one of those numerous experimental papers with which Boussingault has enriched theoretical agriculture, he adverted to the opinion which had been long entertained by some that ammoniacal vapours probably float in the atmosphere in minute quantity, and suggested that those vapors might probably be a natural source of a portion of the nitrogen which is known to be present in plants. This opinion in regard to the presence of ammonia in the atmosphere, was founded upon the known fact that ammonia does escape into the air during the decay of animal substances, and that experimenters, Brandes, among others, as early as 1825, had found ammoniacal salts in rain water. Liebig, who also found a sensible quantity of ammonia in rain water, has recently been led to propound the opinion that *all* the nitrogen contained in plants enters them in the form of ammonia, and that the minute portion which floats in the atmosphere is the source from which they derive this ammonia when it is not present already in sufficient quantity in the soil. On reading his chapter on this subject, we could not help granting—what we were indeed prepared to concede, and in which all recent practical and theoretical writers concur—that ammonia is of great value in promoting vegetation, and that it is one source of the nitrogen of plants; but when we found ourselves in the midst of a paragraph, which assumed it to be proved that ammonia is the *only* source from which their nitrogen is derived, we fancied that we must have inadvertently missed an important step in the argument, and we turned back again and carefully retraced our steps in seach of the missing link in the chain of reasoning—but in vain. It *is* proved that ammonia is very useful to vegetation, and ought never to be wasted in good husbandry; but it is thence *assumed* by Liebig to be the only source of nitrogen to living vegetables. We are the more particular in insisting upon this, because the writer, borne away by his own belief, expresses himself as if he had really deduced his opinion from legitimate premises, and because we have seen many notices of his book, in which, what is merely an opinion of the writer, is really supposed to be proved. But we should be sorry to think that such an opinion was capable of proof, for we are quite sure that it does not truly represent the ordinary procedure of nature.

The author of the work now before us appears to be so far of the same opinion with ourselves, that he mentions another important source of nitrogen to the *general vegetation of the globe*, as he expresses it, besides the ammonia—namely, *nitric acid*, a compound consisting, as we have already said, of nitrogen and oxygen only. The arguments upon which he rests this opinion are stated in his eighth lecture, and are perfectly satisfactory. To us one authority, not quoted by Mr. Johnston, is conclusive. In a work of the celebrated Berzelius of Stockholm, now before us, and which was written in 1829, long before the opinions now in question were agitated, it is stated, "that every flash of lightning that passes through the air must produce a *not inconsiderable* quantity of nitric acid;" and we have seen enough of the incessant lightnings of South America, and of the thunders that precede the monsoons in India, to satisfy us that the quantity of nitric acid produced in the air must be really enormous. When, in addition to this, we recollect that the nitrates of potash and soda have been observed in all climates to promote vegetation when artificially applied to plants, we are inclined to think that in the following summary of his views, which for the sake of brevity we extract from his *Elements*, the agency of nitric acid is rather under than over stated by our author.

"Nitric acid is also naturally formed, and in some countries probably in large quantities, by the passage of electricity through the atmosphere. The air, as has been already stated, contains

much oxygen and nitrogen *mixed* together, but when an electric spark is passed through a quantity of air, a certain quantity of the two *unite* together chemically, so that every spark that passes forms a small portion of nitric acid. A flash of lightning is only a large electric spark; and hence every flash that crosses the air produces along its path a quantity of this acid. Where thunder-storms are frequent, much nitric acid must be produced in this way in the air. It is washed down by the rains, in which it has frequently been detected, and thus reaches the soil, where it produces one or other of the *nitrates* above mentioned.

"It has been long observed that those parts of India are the most fertile in which saltpetre exists in the soil in the greatest abundance. Nitrate of soda, also, in this country, has been found wonderfully to promote vegetation in many localities; and it is a matter of frequent remark, that vegetation seems to be refreshed and invigorated by the fall of a thunder-shower. There is, therefore, no reason to doubt that nitric acid is really beneficial to the general vegetation of the globe. And since vegetation is most luxuriant in those parts of the globe where thunder or lightning are most abundant, it would appear as if the natural production of this compound body in the air, to be afterwards brought to the earth by the rains, were a wise and beneficent contrivance by which the health and vigor of universal vegetation is intended to be promoted.

"It is from this nitric acid, thus universally produced and existing, that plants appear to derive a large, probably, taking vegetation in general, the largest portion of their nitrogen. In all climates they also derive a portion of this element from ammonia; but less from this source in tropical than in temperate climates."

Besides nitric acid and ammonia, there are other substances to which we believe plants owe a part of their nitrogen; but these, we allow, are to be considered as the most important, and we shall therefore hasten forward to the consideration of other topics.

When plants have obtained carbon, in the form of carbonic acid, hydrogen and oxygen in the form of water, and nitrogen in that of nitric acid and ammonia—how does the living plant transform these substances, so as to convert them into portions of its own substance? By what power is the alteration effected—by what succession of chemical changes is the final result brought about? This is a most interesting part of the subject, which our limits prevent us from attempting to enter upon. We may merely state, that the author shows, in a rigorously exact manner, how, in the interior of the plant, the starch of the seed is first converted into the sugar of the sap, how this is then converted into starch, or into woody fibre, and the latter again, when it is required, brought back into the state of starch or sugar. He shows also, how nearly all these changes can be imitated by the art of the chemist in his laboratory; and hence infers that what takes place in the interior of the plant, is no way mysterious in *kind*—it is mainly a series of purely chemical changes. But the mystery in living vegetables, as in living animals, is the process by which all these changes are regulated—which says, here such a change must take place, and to such an extent. A living plant is a cunningly contrived machine, of which chemistry can describe the wheels and the movements, but of which she may never be able to discover, certainly she can never hope to supply, the moving power.

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The second part of the *Lectures* is devoted to the inorganic constituents of plants, and to the geological and chemical relations of soils. We shall first complete our survey of the newest views in regard to the food of plants. We have already adverted to the fact that the various parts of vegetables, when burned in the air, leave behind a comparatively inconsiderable proportion of earthy or incombustible matter. Such is the common woodash, and such the ash left when heaps of weeds or the parings of our grass fields are burned. What is the use of this incombustible matter—what purpose does it serve in the plant—whence is it derived? Is it only present by accident—or does the healthy plant always contain it? Is its quantity constant, and does the same plant always yield the same kind of ash? For an answer to all these questions we must refer the reader to the works before us; but it will be interesting to trace the progress of opinion upon this branch of vegetable chemistry—not only because the subject is exceedingly curious in itself, but because the present state of opinion on this subject is connected with all the recent improvements in agricultural practice, has suggested many of them, and is now directing the enlightened farmer, often unconsciously, in all his most promising practical investigations.

The ash of plants, until a very recent period, was considered by the vegetable physiologists—who, indeed, esteemed themselves the judges paramount in this domain—as accidentally present, or at least as performing no important or necessary function in reference to vegetable life. No account was taken of it, therefore, in theory: and in practice—little as some may think agricultural practice in past times to have been affected by theory—in practice this opinion of the physiologists led to the adoption and justification of the most pernicious system of husbandry; for they naturally reasoned thus: If the organic or combustible part of plants be the only important, vital or essential portion, then, of manures such as are prepared in the farm-yard, it is also the only essential part—and in soils the vegetable or animal matter—the combustible parts of them, that is, which alone supply the plant with organic food—must likewise be the only essential portion. Accordingly, vegetable manures, or animal excrements, directly derived from vegetables, were alone considered necessary to fertilize the land and to feed the crop; and the vegetable matter in the soil was esteemed to be at once the source and the index of its agricultural capabilities. So firmly rooted was the opinion, and so widely spread, and so long has it lingered among practical men, that some of our readers may, even while they peruse these sentences, be unwilling to acknowledge, or have had no opportunity of being satisfied, that it is entirely erroneous. However, among other errors in practice, it led to the total neglect of the inorganic or incombustible part of the crops carried from the land. It was supposed that if a sufficient quantity of vegetable matter was always kept in the soil,

there could be no harm in carrying off what the land produced, or in neglecting that part of the crop which was of no economical value for any other purpose. We might illustrate this by a reference both to still existing, and to many now exploded practices among ourselves, but we rather advert to a custom prevailing among our transatlantic brethren, as described in the very interesting work of one of the best race of our own existing practical farmers. They grow wheat, sell the grain, and either burn or otherwise waste the straw. After wheat they grow clover, which they never cut, but plough in for green manure. The vegetable matter in the soil is thus kept up, all the conditions of the old theory are fulfilled, and yet the land is inevitably going to ruin. The father may not be aware that he is eating sour grapes; but the children's teeth are sure to be set on edge nevertheless.

Again, our West India planters, on their estates in Jamaica and elsewhere, find the land impoverished, and they hardly know why. There may be special local causes by which it is aided here and there, but the main cause is the same as in the United States. The canes are deprived of their juice in the mill, and the *trash*, as the refuse canes are called, is then burned to boil the sugar. The ash they leave is often considered as worse than useless—it is only a troublesome refuse.

Can any one doubt, after such examples as these, that all our practice is modified and has been modified by theory, either for good or for bad? Not that theory has at once said to the farmer, do this, and he hath done it, but the opinions of the vegetable physiologists gradually became a part of the general stock of knowledge among all well-informed men, and, through them, gradually influenced the agricultural practice in every country of Europe.

Then these same theoretical opinions led to curious shifts and contrivances in nomenclature. It was now and then observed, that the addition of inorganic matter to the soil, of wood and peat ashes, of kelp, of saltpetre, and a score of other things, produced a remarkable effect upon vegetation—increased the crop—hastened its growth—gave a heavier return of hay, of straw, and of grain. Was the plant *fed* by these things? Not at all. These were not *manures*, they were *stimulants*. And so we had some substances which were neither manures nor stimulants, but acted by fermentation; while many other like shifts were made necessary by the advance of knowledge, not a few of which still linger among us, and will linger, standing in the way of sounder views and a safer practice, till another generation sees the light. And among the men upon whose minds these shadows of old opinions thus still rest—who have begun to ascend, but have not yet escaped from the mists of the valley—from these men we hear the opinion sagely propounded—"Chemistry must be content to follow—she cannot lead in agriculture." But this is mere fudge; agriculture, above every other art, is accustomed to be led by theory. Every little farmer has his foolish fancies, which direct his practice; and it is only to be lamented, that while so willing to be led, she has been accustomed to listen more frequently to the voice of the mere empyric, than to that of the sound philosopher.

So far as we have seen, she was led by physiology, and into what difficulties;—let us now see what she has begun to think since chemistry took her by the hand, and began at once to teach and to guide her. The ash of plants was the first object of study. Little came of the early analyses of De Saussure. They were inaccurately performed, and it was well that no attempt was made to deduce any important natural consequence from them. But the resources of chemical skill increased, and better instructed men turned their attention to the subject. Sprengel we may mention as the most indefatigable in this line, and one who has mainly contributed to the establishment of the received views—though we may also add, that the highest analytical skill has never yet been enlisted in this cause. These analyses proved that the notion of the organic being the only essential part of the vegetable, could no longer be entertained; that earthy matter was also essential to the existence of the plant; and that in each species of plant, and even in each part of the same plant, the earthy matter was present in a quantity peculiar to itself, while the quantity or kind of matter of which the ash consisted, was also different in different plants, and generally special in each. Well, this being proved by chemistry, what followed from it? Why, that the old physiological doctrine about the essential nature of the vegetable matter, had only looked at the subject with one eye, that now the chemical doctrine opened the other eye, and the plant was then seen to consist of two essential parts—an organic and an inorganic part. But how did this affect practice? Why, thus—the old races of stimulants and fermentators, and all the rest of them were dismissed. The plant has an inorganic part which must be fed, and must grow by the aid of inorganic *food*—it must have mineral food as well as vegetable food. From this it further followed, that vegetable manures, if they make plants grow, do so, not because they supply organic food *only*, but because they contain, and are able to supply inorganic food also. And again, mineral substances made a plant grow, not by some hidden mode of merely stimulating it to take up and appropriate a larger portion of the vegetable matter which had been applied to its roots, but because it actually entered into its substance, and supplied that inorganic food which was not previously within reach of its roots.

Thus, in regard to the soil, it followed from the some doctrine, that mere vegetable matter might be increased to any amount, as by ploughing in green crops, &c., without its being possible to save the land from ultimate barrenness, if crops were continually carried off, and nothing—no mineral matter, that is—restored to it. Let the American farmers burn their straw, and top-dress their soil with the ash; and though they do not convert their straw into manure, as in our fold-yards, yet with the aid of their green clover, their land may retain its fertility for half a century longer, without the addition of foreign manures. Let the ash of the cane trash be used to top-dress the young canes, or be put in holes about their roots, crushing it first when it happens to be melted, and though past mismanagement may not be repaired, further exhaustion will proceed with infinitely greater slowness. We have a

word for our Indian empire too: Let the indigo planters return the refuse of their leaves, when their indigo is extracted, to the fields from which they were gathered, and we assure them from experience, that their lands will not fail them half so soon.

But further than this still the same chemical doctrine goes. It has been found that the ash of nearly all plants contains about *eleven* different incombustible substances, in greater or less quantity, all of which can be derived from the soil only. To produce a healthy vegetation, therefore, the soil must contain all these, and as the most valuable plants, those we raise for food, take up these substances in different proportions, some, for example, requiring more soda, others more potash or lime, it is clear that to grow any of these plants, the soil must contain an especial supply of that substance, which the species we select may happen to require. And so, when we sow our selected seed, we are safe so far in adding to the soil a portion of that substance, at the same time, by way of a manure; and safer still, if we have previously ascertained the soil to be deficient in that substance—while, on the other hand, if the soil be destitute of it, and we cannot obtain a supply, we need not sow our seed. If, for example, the soil contain gypsum, or sulphate of soda, or sulphate of magnesia, it will grow red clover; if it contains none of these, we need hardly sow our seed, unless we can add some sulphate or other along with it. The whole theory of mineral manures was first, we believe, systematically treated by Lampadius; it was subsequently expanded by Sprengel, in one of his valuable works: and though it has not yet generally diffused itself every where, it is rapidly assuming the direction of all agricultural improvements among ourselves, and the works now before us will serve an important purpose, in making generally known among practical men the nature and important practical bearing of the new chemical agriculture.

But the consequences of the same chemical doctrine, of the *essential* nature of the incombustible constituents of plants, lead us still further, to what appear more remote, yet are still necessary and very curious truths. The soil draws its supplies from the manure that is added to it—the plant takes them from the soil—the animal from the plants it feeds upon—and if it increase neither in size nor weight, it returns all the mineral matter to the soil again, in the form of manure. Here is a beautiful circle of natural operations, connecting together the living and the dead—the animate with the inanimate—the plant with the animal, in one common and mutual dependence. The theory, therefore, that throws new light upon one of these branches, will illuminate all. If the soil do not contain all that the plant requires, either the plant will die, or it will lead a sickly life. If the plants, again, on which it feeds be deficient in some one substance which is necessary to build up the various solid and fluid parts of the animal, it will also pine away, and sooner or later die. So that on the constitution of the soil is dependent the health and life of all the animals that are fed upon its produce; in other words, the same chemical doctrine extends its influence to the feeding of stock, and must in future (insensibly, it may be, but surely) modify all our notions regarding the feeding of animals, and direct to the wisest, safest, best, and most economical management on the part of the breeder and feeder of cattle, as well as of the arable farmer and grower of corn.

Space will not permit us to dwell longer on this subject, otherwise it would have been curious to follow the progress of opinion in regard to the uses of the soil; of what it ought to consist, and on what its fertility depends; from the time when, half a century ago, Ruckert gave forth the view, "that a soil must contain all the substances which are found in the decomposed plant, and that on the presence of these in the soil, its fertility must in some measure depend;" through those puerile times, during which the Berlin Academy gave a prize to one of its members for *proving* that these earthy and saline substances were actually formed in and by the plant; to the very recent period when Crome and Schubler again taught, that the fertility of a soil depended mainly on its physical properties. But there remain two or three other topics to which we are anxious still to advert, and we must, therefore, content ourselves with expressing our entire concurrence in the old doctrine of Ruckert, established, we may almost say, by the experimental researches of Lampadius and Sprengel, supported by the opinion of Liebig, and fully and practically brought out by the author of the works now before us.

The connexion of geology with agriculture, as we have already stated, was in some measure foreseen and touched upon by Davy. It has also attracted the attention of some of the German writers; but in so far as we know, it is not treated of in a systematic manner in any existing work, either English or foreign, with the exception of the lectures on agricultural geology now before us. There are considerable difficulties in the way of establishing a close connexion between the soils of a country and the rocks of which its surface is composed, though there can be no doubt that the general agricultural character of every extensive district is dependent upon that of the stratified or unstratified deposites on which the district rests. Thus after giving a detailed description of the nature of the soils formed from the stratified rocks of each geological period, and of the localities where such soils are seen in our islands, our author concludes with these observations—

"The consideration of the facts above stated shows how very much the fertility of each district is dependent upon its geological structure—how much a previous knowledge of that structure is fitted to enlighten us, in regard to the nature of the soils to be expected in any district—to explain anomalies also in regard to the unlike agricultural capabilities of soils apparently similar—to indicate to the purchaser where good or better lands are to be expected, and to the improver, whether the means of ameliorating his soil by liming by marling or by other judicious admixture, are likely to be within his reach, and in what direction they are to be sought for."

* * * * * * *

It is an opinion universally entertained among practical men, that taking animal manures in general, any given weight of them is more valuable in promoting the growth of a crop, than an equal weight of the vegetable products on which the animal has been fed. This is true

not only of animal excretions, but of the various parts of animal bodies also. This superior effect is in part explained by the fact, that they are all richer in nitrogen, and during their decay, therefore, give off a larger quantity of ammonia than an equal weight of any vegetable substance employed for food. But how does the animal matter acquire this richness? We inhale oxygen, but no nitrogen, from the atmosphere—how, then, is the vegetable matter changed in passing through the animal? What, in short, is the effect of the digestive process upon our vegetable food? The mystery is thus simply explained:

"Animals have two necessary vital functions to perform—to breathe and to digest. Both are of equal importance to the health and general welfare of the animal. The digester (the stomach) receives the food, melts it down, extracts from it what is best suited to its purposes, and conveys it into the blood. The breathers (the lungs) sift the blood thus mixed up with the newly digested food, combine oxygen with it, and extract carbon—which carbon, in the form of carbonic acid, they discharge by the mouth and nostrils into the air.

"Such is a general description of these two great processes—their effect upon the food that remains in the body and has to be rejected from it, is not difficult to perceive.

"Suppose an animal to be full grown. Take a full grown man. All that he eats as food is intended merely to renovate or replenish his system, to restore that which is daily removed from every part of his body by natural causes. *In the full grown state, every thing that enters the body must come out of the body* in one form or another. The first part of the food that escapes is that portion of its carbon that passes off from the lungs during respiration. This portion varies in weight in different individuals—chiefly according to the quantity of exercise they take. From five to nine ounces a-day is the average quantity, though in periods of violent bodily exertion thirteen to fifteen ounces of carbon are breathed out in the form of carbonic acid.

"Suppose a man to eat a pound and a half of bread, and a pound of beef in twenty-four hours, and that he gives off by respiration eight ounces of carbon (3500 grains) during the same time. Then he has

	Carbon.	Nitrogen.
Taken, in his food, about	4500 grains,	and 500 grains, while
He has given off in respiration,	3500	and little or no nitrogen.
Leaving to be converted into food, or to be rejected	1000 grains	and 500 grains.

"Our two conclusions, therefore, are clear. The vegetable food, by respiration, is freed from a large portion of its carbon, which is discharged into the air—nearly the whole of the nitrogen remaining behind.

"It is out of this residue, rich in nitrogen, that the several parts of animal bodies are built up. Hence the reason why they can be formed from food poor in nitrogen, and yet be themselves rich in the same element.

"It is this same residue also, which after it has performed its functions within the body, is discharged again in the form of solid and liquid excretions. Hence the greater richness in nitrogen—the greater fertilizing power of the dung of animals, than of the food on which they live."—*Elements*, pp. 171, 172.

We here see how it is that the excretions of animals, and especially of full grown animals, should be richer in nitrogen than the vegetables on which they are fed; and the same reasoning applies to the inorganic matter originally contained in the vegetable food. As a whole, the food is greatly diminished in weight during digestion, but nearly all the nitrogen and the whole of the inorganic matter still remain in it, and therefore it must be proportionately more influential as a manure, in so far as its action depends upon either of these constituents.

Again, the study of the purposes served by the food of animals, while it shows what a truly nourishing vegetable food must contain, throws much light also on what must necessarily enter into the food of plants.

"Man, and all domestic animals, may be supported, may even be fattened upon vegetable food alone—vegetables, therefore, must contain all the substances which are necessary to build up the several parts of animal bodies, and to supply the waste attendant upon the performance of the necessary functions of animal life. Let us consider what these substances are, and in what quantities they must be supplied to the human body.

"1. *The food must supply carbon for respiration.*

"A man of sedentary habits, or whose occupation requires little bodily exertion, may respire about five ounces of carbon in twenty-four hours; one who takes moderate exercise, about eight ounces; and one who has to undergo violent bodily exertion, from twelve to fifteen ounces.

"If we take the mean quantity of eight ounces, then, to supply this alone, a man must eat eighteen ounces of starch or sugar every day. If he take it in the form of wheaten bread, he will require 1¾ lbs. of bread, if in the form of potatoes, about 7½ lbs. of raw potatoes, to supply the waste caused by his respiratory organs alone.

"When the habits are sedentary, five lbs. of potatoes may be sufficient, when violent and continued exercise is taken, twelve to fifteen lbs. may be too little. At the same time it must be observed, that where the supply is less, the quantity of carbonic acid given off will either be less also, or the deficiency will be supplied at the expense of the body itself. In either case the strength will be impaired, and fresh food will be required to recruit the exhausted frame.

"2. *The food must repair the daily waste of the muscular part of the body.*

"When the body is full grown, a portion from every part of it is daily abstracted by natural processes, and rejected either in the perspiration or in the solid and fluid excrements. This portion must be supplied by the food, or the strength

will diminish—the frame will gradually waste away."

Among the substances thus daily removed from the body, are portions of muscular fibre (fibrin), of the clot of the blood, of gelatine, &c., all of which contain nitrogen, and must be replaced by the gluten of wheat flour, by the fibrin of lean meat, by the white of eggs, (albumen,) by the curd of cheese, (cassein,) or by some similar substance in the food.

"The quantity of one or other of these removed from the body in twenty-four hours, either in the perspiration or in the excretions, amounts to *about five ounces*, containing 350 grains of nitrogen, and this waste *at least* must be made up by the gluten or fibrin of the food.

"In the 1¾ lbs. of wheaten bread we have supposed to be eaten to supply carbon for respiration, there will be contained also about three ounces of gluten. Let the other two ounces be made up in beef, of which half a pound contains two ounces of dry fibrin, and we have

	For respiration.		For waste of muscle, &c.
1¾ lbs. of bread yielding,	18 oz. starch	and	3 oz. of gluten.
8 oz. of beef yielding,			2 oz. of fibrin.
Total consumed by respiration, and the ordinary waste,	18 oz. starch	and	5 oz. of gluten or fibrin.

"If, again, the 7½ lbs. of potatoes be eaten, then in these are contained about 2½ ounces of gluten or albumen, so that there remain 2½ ounces to be supplied by beef, eggs, milk, or cheese.

The reader, therefore, will understand why a diet which will keep up the human strength is easiest compounded of a mixture of vegetable and animal food. It is not merely that such a mixture is more agreeable to the palate, or even that it is absolutety necessary—for, as already observed, the strength may be fully maintained by vegetable food alone; it is because without animal food in one form or another, so large a bulk of vegetable food must be consumed in order to supply the requisite quantity of nitrogen in the form of gluten. Of ordinary wheaten bread alone, about three pounds daily must be eaten to supply the nitrogen, and there would then be a considerable waste of carbon in the form of starch, by which the stomach would be overloaded, and which, not being worked up by respiration, would pass off in the excretions. The wants of the body would be equally supplied, and with more ease, by 1¾ lbs. of bread, and 4 ounces of cheese.

"Of rice, again, no less than four pounds daily would be required to impart to the system the required proportion of gluten; and it is a familiar observation of those who have been in India, and other countries where rice is the usual food of the people, that the degree to which the natives distend, and apparently overload their stomachs with this grain, is quite extraordinary.

"The stomachs and other digestive apparatus of our domestic animals are of larger dimensions, and they are able, therefore, to contain with ease as much vegetable food, of almost any wholesome variety, as will supply them with the quantity of nitrogen they may require. Yet every feeder of stock knows that the addition of a small portion of oil-cake, a substance rich in nitrogen, will not only fatten an animal more speedily, but will also save a large *bulk* of other kinds of food."

Another purpose served by the food, in regard to which we have not space to quote the words of our author, is to supply the earthy and saline substances contained in the solids and fluids of the body. Of the earthy matter in the bones, and of the saline matter in the blood and in other fluids, a portion is every day rejected, a new portion must therefore every day be introduced into the body with the food, or the animal pines away and dies. This brings us back again to what we have formerly stated, that the soil must contain these substances as essential constituents—since they are so essential to the vegetable tribes that these latter could not fulfil their great purpose in the economy of nature—that of feeding the animal race—if they did not contain them. This reasoning backwards from the wants of animals, had we no other arguments on the subject, were alone sufficient to explode the absurdities of the accidental or non-essential nature of the inorganic part of vegetables, and of the fertility of soils being mainly dependent upon their physical properties. In short, one leading chemical idea pervades the entire field of theoretical agriculture—explains almost every important step which is taken by the enlightened practical farmer—and points the way to those further, and, we trust, large advances which the art of culture is yet destined to make, since the accelerated march of sound opinions is bringing under their influence a daily increasing number of the most intelligent farmers of the country.

CATERPILLARS ON THE ELMS.—HESSIAN FLY.

From Harris' Report on the Insects of Massachusetts.

Among the numerous insects that infest our noble elms, the largest is a kind of sphinx, which, from the four short horns on the fore part of the back, I have named *Ceratomia quadricornis*, or four-horned ceratomia. On some trees these sphinges exist in great numbers, and their ravages then become very obvious; while a few, though capable of doing considerable injury, may escape notice among the thick foliage which constitutes their food, or will only be betrayed by the copious and regularly formed pellets of excrement beneath the trees. They are very abundant during the months of July and August, on the large elms which surround the northern and eastern sides of the Common in Boston; and towards the end of August, when they descend from the trees for the purpose of going into the ground, they may often be seen crawling in the mall in considerable numbers. These caterpillars, at this period of their existence, are about three inches and a half in length, are of a pale green color, with seven oblique white lines on each side of the body, and a row of little notches, like saw-teeth, on the back. The four short horns on their shoulders are also

notched, and like most other Sphinges, they have a long and stiff spine on the hinder extremity of the body. They enter the earth to become chrysalids and pass the winter, and come forth in the winged state in the month of June following, at which time the moths may often be found on the trunks of trees, or on fences in the vicinity. In this state their wings expand nearly five inches, are of a light brown color, variegated with dark brown and white, and the hinder part of the body is marked with five longitudinal dark brown lines. A young friend of mine, in Boston, captured on the trunks of the trees a large number of these moths during a morning's walk in the mall, the past summer, although obliged to be on the alert to escape from the guardians of the common, whose duty it was to prevent the grass from being trodden down. Nearly all of these specimens were females, ready to deposite their eggs, with which their large bodies were completely filled. On being taken, they made scarcely any efforts to escape, and were safely carried away. It would not be difficult, by such means, very considerably to reduce the number of these destructive insects; in addition to which it might be expedient, during the proper season, for our city authorities to employ persons to gather and kill every morning the caterpillars which may be found in those public walks where they abound.

Grape-vine caterpillars.—From the genus Sphinx I have separated another group, to which I have given the name of *Philampelus*,* from the circumstance that the larvæ or caterpillars live upon the grape-vine. When young they have a long and slender tail recurved over the back like that of a dog; but this, after one or two changes of the skin, disappears, and nothing remains of it but a smooth, eye-like, raised spot on the top of the last segment of the body. Some of these caterpillars are pale green and others are brown, and the sides of their body are ornamented by six cream-colored spots, of a broad oval shape, in the species which produces the *Satellitia* of Linnæus, narrow oval and scalloped, in that which is transformed to the species called *Achemon* by Drury. They have the power of withdrawing the head and the first three segments of the body within the fourth segment, which gives them a short and blunt appearance when at rest. As they attain to the length of three inches or more, and are thick in proportion, they consume great quantities of leaves; and the long leafless branches of the vine too often afford evidence of their voracity. They also devour the leaves of the common creeper (*Ampelopsis quinquefolia*) which with those of our indigenous vines, were their only food till the introduction and increased cultivation of foreign vines afforded them an additional supply. They come to their growth during the month of August, enter the earth to transform, and appear in the winged or moth state the following summer in June and July. The *Satellitia* Hawk-moth expands from four to five inches, is of a light olive color, variegated with patches of darker olive. The *Achemon* expands from three to four inches, is of a reddish ash-color, with two triangular patches of deep brown on the thorax, and two square ones on each fore wing; the hind wings are pink, with a deeper red spot near the middle, and a broad ash-colored border behind.

The grape-vine suffers still more severely from the ravages of another kind of Sphinx caterpillars, smaller in size than the preceding, and like them solitary in their habits, but more numerous, and, not content with eating the leaves alone, in their progress from leaf to leaf down the stem, they stop at every cluster of fruit, and, either from stupidity or disappointment, nip off the stalks of the half-grown grapes, and allow them to fall to the gound untasted. I have gathered under a single vine above a quart of unripe grapes thus detached during one night by these caterpillars. They are naked and fleshy like those of the *Achemon*, and *Satellitia*, and are generally of a pale green color, (sometimes, however, brown,) with a row of orange colored spots on the top of the back, six or seven oblique darker green or brown lines on each side, and a short spine or horn on the hinder extremity. The head is very small, and, with the fore part of the body, is somewhat retractile, but not so completely as in the two preceding species. The fourth and fifth segments being very large and swollen, while the three anterior segments taper abruptly to the head, the fore part of the body presents a resemblance to the head and snout of a hog. This suggested the generical name of *Chærocampa*, or hog caterpillar, which has been applied to some of these insects. The species under consideration is found on the vine and the creeper in July and August; when full grown it descends to the ground, conceals itself under fallen leaves, which it draws together by a few threads so as to form a kind of cocoon, or covers itself with grains of earth and rubbish in the same way, and under this imperfect cover it changes to a pupa or chrysalis, and finally appears in the winged state in the month of July of the following year. The moth, to which Sir James Edward Smith gave the name of *Pampinatrix*, from its living on the shoots of the vine, expands from two and a half to three inches, is of an olive gray color, except the hind wings, which are rust-colored, and the fore wings and shoulder-covers are traversed with olive-green bands.

Hessian fly.—The far-famed Hessian fly, and the wheat fly of Europe, and of this country, are small gnats or midges, and belong to the family called *Cecidomyiadæ*, or gall gnats. The insects of this family are very numerous, and most of them, in the maggot state, live in galls or unnatural enlargements of the stems, leaves and buds of plants, caused by the punctures of the winged insects in laying their eggs. The Hessian fly, wheat fly, and some others differ from the majority in not producing such alterations in plants. The proboscis of these insects is very short, and does not contain the piercing bristles found in the long proboscis of the biting gnats and mosquitoes. Their antennæ are long, composed of many little, bead-like joints, which are larger in the males than in the other sex; and each joint is surrounded with short hairs.

Their eyes are kidney-shaped. Their legs are rather long and very slender. Their wings have only two, three, or four veins in them, and are fringed with little hairs around the edges; when not in use, they are generally carried flat on the back. The hind body of the females often ends with a retractile, conical tube, wherewith they de-

* The literal signification of this word is, *I love the vine.*

posite their eggs. Their young are little footless maggots, tapering at each end, and generally of a deep yellow or orange color. They live on the juices of plants, and undergo their transformations either in these plants or in the ground.

The Hessian fly was scientifically described by Mr. Say, in 1817, under the name of *Cecidomyia destructor*. It obtained its common name from a supposition that it was brought to this country in some straw, by the Hessian troops under the command of Sir William Howe, in the war of the Revolution. This supposition, however, has been thought to be erroneous, because the early inquiries made to discover the Hessian fly in Germany were unsuccessful; and, in consequence thereof, Sir Joseph Banks, in this report to the British government, in 1789, stated that "no such insect could be found to exist in Germany or any other part of Europe." It appears, however, that the same insect, or one exactly like it in habits, had been long known in Europe; an account of it may be found in Duhamel's "Practical Treatise of Husbandry," and in a communication made to the Duke of Dorset, in 1788, by the Royal Society of Agriculture of France. In the year 1833, the wheat in Hungary was considerably injured by an insect of the same kind, supposed to be the Hessian fly by the Baron Kollar. Moreover, Mr E. C. Herrick, of New Haven, Connecticut, has recently published an account of this discovery of the true Hessian fly, by Mr James D. Dana, in Minorca, near Toulon in France, and in the vicinity of Naples. Nothing has yet been found relative to the existence of the Hessian fly in America before the Revolution. It was first discovered in the year 1776, in the neighborhood of Sir William Howe's debarkation on Staten Island, and at Flat Bush, on the west end of Long Island. Having multiplied in these places, the insects gradually spread over the southern parts of New York and Connecticut, and continued to proceed inland at the rate of fifteen or twenty miles a-year. They reached Saratoga, two hundred miles from their original station, in 1789. Dr. Chapman says that they were found west of the Alleghany mountains in 1797; from their progress through the country, having apparently advanced about thirty miles every summer. Wheat, rye, barley and even timothy grass were attacked by them; and so great were their ravages in the larva state, that the cultivation of wheat was abandoned in many places where they had established themselves. In a communication by Mr. J. W. Jeffreys, published in the sixth volume of Buel's Cultivator, it is stated, that soon after the battle of Guildford, in North Carolina, the wheat crops were destroyed by the Hessian fly in Orange county, through which the British army, composed in part of Hessian soldiers, had previously passed. Although it is possible that, in this instance, the chinch bug may have been mistaken for the Hessian fly, the remark shows how prevalent was the belief respecting the introduction of the latter. The foregoing statements, taken in connexion with the habits of the Hessian fly, induce me to think that the common opinion relative to its origin is deserving of some credit, although we are as yet without any positive evidence of the existence of this insect in Germany.

The following brief history of the habits and transformations of the Hessian fly will be found to agree essentially with the excellent observations on this insect, written in the year 1797, by Dr. Isaac Chapman, and published in the fifth volume of the "Memoirs of the Philadelphia Society for promoting Agriculture." Mr. Herrick has kindly permitted me to make free use of his valuable account of this insect, contained in the forty-first volume of "The American Journal of Science," and of other information communicated by him to me in various letters. The latter gentleman has spent some time in carefully observing the habits of the fly, during many years in succession; and, having fitted himself for the task by the study of the natural history of insects in general, his statements may be implicitly relied upon. Moreover, they are corroborated by the observations of many other persons, published in various works, which I have consulted in the course of my investigations. Nor have I neglected to examine every thing on this insect that has fallen under my notice, and shall hereafter allude to some of the contradictory statements that have been published relative to certain parts of its economy.

The head and thorax of this fly are black. The hind body is tawny, and covered with fine grayish hairs. The wings are blackish, but are more or less tinged with yellow at the base, where also they are very narrow; they are fringed with short hairs, and are rounded at the end. The body measures about one-tenth of an inch in length, and the wings expand one quarter of an inch, or more. It is a true *Cecidomyia*, differing from *Lasioptera* in the shortness of the first joint of its feet, and in the greater length of its antennæ, the bead-like swellings whereof are also more distant from each other. Two broods or generations are brought to maturity in the course of a year, and the flies appear in the spring and autumn, but rather earlier in the southern and middle states than in New England. The transformations of some in each brood appear to be retarded beyond the usual time, as is found to be the case with many other insects; so that the life of these individuals, from the egg to the winged state, extends to a year or more in length, whereby the continuation of the species in after years is made more sure. It has frequently been asserted that the flies lay their eggs on the grain in the ear; but whether this be true or not, it is certain that they do lay their eggs on the young plants, and long before the grain is ripe; for many persons have witnessed and testified to this fact. In the New England states, winter wheat, as it is called, is usually sown about the first of September. Towards the end of this month, and in October, when the grain has sprouted, and begins to show a leaf or two, the flies appear in the fields, and, having paired, begin to lay their eggs, in which business they are occupied for several weeks. The following interesting account of the manner in which this is done was written by Mr. Edward Tilghman, of Queen Ann county, Maryland, and was published in the eighth volume of the Cultivator, in May, 1841. "By the second week of October, the first sown wheat being well up, and having generally put forth its second and third blades, I resorted to my field in a fine warm forenoon, to endeavor to satisfy myself by ocular demonstration, whether the fly did deposite the egg on the blades of the growing plant. Selecting a favorable spot to make my observation, I placed myself in a re-

clining position in a furrow, and had been on the watch but a minute or two, before I discovered a number of small black flies alighting and sitting on the wheat plants around me, and presently one settled on the ridged surface of a blade of a plant, completely within my reach and distinct observation. She immediately began depositing her eggs in the longitudinal cavity between the little ridges of the blade. I could distinctly see the eggs ejected from a kind of tube or sting. After she had deposited eight or ten eggs, I easily caught her upon the blade, and wrapped her up in a piece of paper. I then proceeded to take up the plant, with as much as I conveniently could of the circumjacent earth, and wrapped it all securely in a piece of paper. After that I continued my observations on the flies, caught several similarly occupied, and could see the eggs uniformly placed in the longitudinal cavities of the blades of the wheat; their appearance being that of minute reddish specks. My own mind being thus completely and fully satisfied as to the mode in which the egg was deposited, I proceeded directly to my dwelling, and put the plant with the eggs upon it, in a large glass tumbler, adding a little water to the earth, and secured the vessel by covering it with paper so that no insect could get access to the interior. The paper was sufficiently perforated with pin holes for the admission of air. The tumbler with its contents was daily watched by myself to discover the hatching of the eggs. About the middle of the fifteenth day from the deposite of the eggs, I was so fortunate as to discover a very small maggot or worm, of a reddish cast, making its way with considerable activity down the blade, and saw it till it disappeared between the blade and stem of the plant. This, I have no doubt, was the produce of one of the eggs, and would, I presume, have hatched much sooner, had the plant remained in the field. It was my intention to have carried on the experiment, by endeavoring to hatch out the insect from the flax-seed state into the perfect fly again; but being called from home, the plant was suffered to perish. The fly that I caught on the blade of the wheat, as above stated, I enclosed in a letter to Mr. John S. Skinner, the editor of the "American Farmer," of Baltimore, who pronounced it to be a genuine Hessian fly, and identical in appearance with others recently received from Virginia."

The best modes of preventing the ravages of the Hessian fly are thus stated by Mr. Herrick:—"The stouter varieties of wheat ought always to be chosen, and the land should be kept in good condition. If fall wheat is sown late, some of the eggs will be avoided, but risk of winter-killing the plants will be incurred. If cattle are permitted to graze the wheat fields during the fall, they will devour many of the eggs. A large number of the pupæ may be destroyed by burning the wheat stubble immediately after harvest, and then plowing and harrowing the land. This method will undoubtedly do much good. As the Hessian fly also lays its eggs, to some extent, on rye and barley, these crops should be treated in a similar manner."

CANADA THISTLES.

From the New Genesee Farmer.

This communication deserves particular attention.

Mr. Henry Colman—An allusion appears to be made in the May number of the New Genesee Farmer, to a conversation with you when you were in this place, some little time since, relative to the destruction of that pest, the Canada thistle.

The way of doing it, which is both sure and certain and attended with but little expense, would be profitably expended in any land infested with any foul weeds or worn down by shallow ploughings. All the foul seeds in the ground would sprout and be destroyed and the ground be left in first rate order for wheat, or almost any other crop: and if the ploughings could be made twelve inches deep, the wheat would not be much liable to get winter killed. And if the same amount of green vegetation could be ploughed under that would be in the thistle patches, the good effects thereof would be lasting, as much so, or more, than a heavy coat of manure. In a visit to my brother Aaron, then living in South Le Roy, in 1841, but now Pavilion, I noticed that the wheat on a part of his field was twice as large as on other parts. I inquired of him how it happened that there was such a difference in his wheat. O! says he, that is where my old thistle bed was six years ago, that the wheat is so stout. I can feel the difference where the thistles were the moment the plough strikes it; the land is more mellow, and the plough inclined to go deeper than in any other parts of the field. The way I took to destroy them, says he, I commenced ploughing them about the first of June, in the most careful and thorough manner, taking special care that not a single thistle root should escape the plough. A mouth from that time I ploughed again in the same careful manner,—and in another month I ploughed again; the fourth month I ploughed it again, making four ploughings, not harrowing it at all, that it should be left in the same order at each time as the plough left it, excepting the last time, when it was in high order for the sowing of wheat. Not a particle of any foul weed appeared upon it, and I got as fine a crop of wheat as I ever had on any lands, and not a single particle of a thistle could be found among the wheat when I harvested it.

I have not the least doubt if any person troubled with thistles, or any other foul weeds, will follow the method here laid down, in as thorough a manner as my brother did, they would be utterly and completely destroyed.

Thus it may be seen that the entire destruction of the pest costs nothing; it is merely a superior method of preparing the land for a crop of wheat, and that the extra expense will be found to be more than compensated by an extra crop of wheat and the finer tilth in which the land will be left, when the wheat is taken from it, over that managed in the common way.

I am, respectfully, your friend, &c.

THOMAS TUFTS.

Le Roy, June 9th, 1842.

GREAT DISMAL SWAMP.

Extract from Lyell's Lectures.

Many of you, I suppose, have seen the morass called the Great Dismal, in North Carolina and Virginia: and you have probably had an opportunity, as I have, of crossing the northern extremity of it on a railway supported by piles from Norfolk to Weldon. This is no less than forty miles from north to south, and twenty from east to west covered entirely with various forest trees, under which is a great quantity of moss; the vegetation is of every variety of size from common creeping moss to tall cypresses 130 feet high. The water surrounds the roots of these trees for many months in the year. And this is a most singular fact to one who has travelled only in Europe, that, as is the case in the United States, trees should grow in the water, or surrounded to a certain height by water, and yet not be killed. This Great Dismal was explored some years since by Mr. Edmund Ruffin, author of a valuable agricultural journal. He first calls attention to the fact that a greater portion of the vast morass stands higher than the ground that surrounds it; it is a great spongy mass of peat, standing some seven or eight feet higher than its banks, as was ascertained by careful measurements when the railroad was cut through. It consists of vegetable matter with a slight admixture of earthy substance, as in coal. The source of peat in Scotland is that one layer of vegetation is not decomposed before another forms. So it is in Chili, Patagonia, and Terra del Fuego. Thus also is it in different parts of Europe, in the Falkland Islands, as Darwin has shown. Thus, too, is it in the Great Dismal, where the plants and trees are different from those of the peat in New York. It is found on cutting down the trees and draining the swamp and letting in the sun, that the vegetation will not be supported as it was before beneath the dark shades of the trees. In the middle is a fine lake, and the whole is inhabited by wild animals, and it is somewhat dangerous to dwell near it by reason of the bad atmosphere it creates. It is covered by most luxuriant vegetation. We find in some places in England that there is a species of walking mosses which are sometimes seized with a fancy to walk off from their places: the moss swells up, bursts and rolls off, sometimes burying cottages in its path. In some places this peat has been dug into and houses have been found several feet below the surface—curious antiquarian remains. In the same manner the Great Dismal may spread itself over the surrounding country.

HANDLING COTTON.

Extract from the Southern (Miss.) Planter.

As you say, the subject of cotton but too readily suggests itself to the mind of every southerner—and while we may flatter ourselves at having arrived to some degree of perfection in the cultivation of the growing plant, there is one point we must all acknowledge has been too much neglected by our planters. I allude to the *handling* of cotton after it is made or gathered from the fields. The article advises the system of *throwing cotton into large piles in our gins* so soon as picked, in order to undergo the process of *heating*. It contends that it diffuses the oil of the seed into the lint, thereby producing a richer color and more substantial fibre. This is an important point in the *handling* of cotton, and the views of the writer are so different from my own that I cannot refrain from offering you some objections to it. I regard this system as, unfortunately for our own interests, but too much in practice at present. The low condition of our cotton market, at the present time particularly, calls for a reformation among our planters, and urges upon them the necessity of sending our crops for sale in a better condition. Much can be said upon this subject—too much is required, for me to attempt it at present, and I shall content myself merely by stating my views in relation to the system above alluded to.

I do not think, then, that the color of cotton is improved by *heating*, but it is a serious injury in many respects. It is true some becomes more yellow—whilst some assumes a bluish cast, consequently not uniform—and even that which does become more yellow, does not present the bright lively color so much desired. We all know that there is more or less dirt or dust in cotton when brought from the fields—by heating, this dirt stains the cotton, or rather causes it to assume a dingy, dull appearance, in contrast with the natural, lively, bright, cream color, which it exhibits when dried upon the scaffolds. The fibre, too, is injured—loses its elasticity and strength—becomes dead and heavy in appearance. I admit that it gins more easily, but is that not an evidence of loss of strength? I contend, too, that the sun, when it is exposed upon the scaffolds, will draw the oil from the seed, dissipate the water and diffuse the oil into the fibre, much better than can be accomplished by heat from moisture—the dust will be shaken out, or if not, will become so dry as not to injure the cotton before it reaches the gin stand, where it will be, or *should be*, entirely separated. Cotton which has been heated in piles will gin easier and faster, but not so well—will be torn off from the seed in large flakes which cannot be separated by the brush, each fibre to itself, which causes it to present that carded appearance which attracts the fancy of the buyer. These are my simple reasons for believing that a thorough course of drying upon scaffolds in the sun is the better plan, and the only practical plan of producing a perfect article for market. By the one process we obtain an irregular yellow color, dull, lifeless, dingy cotton---by the other, a rich, lively, bright cream-color, with more elasticity, as is plainly discovered at the press, by those who have tried it. The writer above alluded to is also deceived in another fact. He assigns, as a reason that the sun destroys the color of cotton, the fact, that cotton picked immediately after opening has the richest color. This is true---and it loses its color by exposure to the *dews*, and not to the sun. So, also, cotton picked early in the season has a richer color than that picked late, and that is owning to the sun having more power—dissipating the moisture before it has time to bleach the cotton.

These reflections I have hastily thrown together—and they are now at your disposal—should you deem them worthy of insertion in the Southern Planter, I may from time to time give you my

views in relation to other points in the *system of handling cotton.* Very respectfully yours, &c.

HALLER NUTT.

Laurel Hill, Jefferson county, April 22, 1842.

REJOINDER ON THE DOCTRINE OF ROTATION OF CROPS.

For the Farmers' Register, (in lieu of No. 6.)

Before the receipt of the last Register I had been casting in my mind on what subject I should prepare another number. I am now more than relieved; for, instead of no subject at all, I have too much subject. I was once sitting at the table of a friend, at which a Frenchman was also a guest. Seeing the hospitable hostess loading his plate with more food than he could devour, in all the feverish eagerness of his country, he exclaimed, "plenty, plenty, madame, too moush plenty." In the same manner, when I opened the last Register, and found myself assailed, not by *one* formidable opponent alone, but by *two*, and one of these the veteran editor himself, I could but think of my Frenchman, and with him exclaim, plenty, plenty, gentlemen, too much plenty.

When I wrote my little unpretending piece on rotation of crops, (I really intended it should be a *modest*, not a "Le Noir Faineant" affair,) I was aware that some of the sentiments therein contained would be regarded as novel, and therefore would probably call forth the strictures of some who were wedded to their own peculiar notions on this subject. In anticipation, then, of such an event, I thought I had prepared the way for mercy, by "bespeaking their kindness, and that if they thought proper to inflict upon me a castigation, it might be as moderate and gentle as possible." Like King David, when his son was in rebellion against him, I stood in the gate and earnestly entreated my assailants as they came forth to "deal *gently* with the young man Absalom." But how does the matter stand? Notwithstanding my earnest entreaty, first, "Wm. M. Peyton, of Big Lick, Roanoke county," (there are men of extraordinary size in that country, and I suspect Mr. Peyton is a giant,) falls foul of me in the most merciless manner; and then the editor coming up, (he too is a *great* man,) and finding a few places which were not already beaten to a mummy, attacks these few; and thus both together leave me, supposing me to be dead outright. Having obtained so signal a victory, as they supposed, they were in too great haste to celebrate it; and it is owing to this imprudence that I have escaped with my life. The *amount* of the injury is, that in this unequal contest I was very much bruised; some of the blows were so severe as to stun me for the moment; but now I have pretty well recovered from my fright, and I am happy to say that my wounds are in a state of rapid convalescence; so that—boasting aside—I am again prepared to meet my adversaries, one or both, just as they please. But I greatly prefer one at a time, if you please, gentlemen. In ordinary cases I consider all artifice as absolutely inexcusable; but, in times of war, I believe it is considered, even by the most polite nations, and by the most accomplished generals, as perfectly consistent with the laws of honor, to resort to their "*ruses de guerre.*" No one ever yet considered it as dishonorable in the one surviving Horatius, to *feign* a retreat when sorely pressed by the *three* Curatii. In the same manner, assailed as I am by *two* formidable adversaries at once, each of whom is amply sufficient for any *one* man, I hope I shall be permitted to separate them. On the other hand, as the *challenged* party, I have a *right* to dictate the terms of contest. I say then to the editor, Stand aloof—restrain your ardors for the fight—I will not even allow you to shout "*hurra!*" whilst your associate and I are in the conflict. If I escape alive, I hereby promise to pay my respects to you. I also give you notice that, in this contest, it may suit my purpose to give *you* an occasional "side wipe" or "back-handed blow," but even in that event, you are not to return the compliment, but still keep cool at your respectful distance.

There is also another preliminary on which I shall insist, and that is, that Mr. Peyton shall also come single-handed; at least he must leave De Candolle, Macaire Princep, and every other Frenchman, behind him. If my adversary is acquainted with these gentlemen, and has enlisted them in his service, then he has an advantage over me which I am by no means disposed to yield. For my part, I know almost nothing of them except what Liebig has told me, and from his account, I feel no great solicitude to cultivate much further acquaintance with them. If, however, Chaptal, Sir H. Davy, Liebig, Buel, Webster and Dana can be of any service to him, he may bring them. But to the Frenchmen I positively object; for they are almost utter strangers to me.

One other preliminary settled, and the gentleman and I will be prepared for the matter in hand, and that is, that he shall not be so nice and critical in his distinctions. He may employ his Latin words as much as he pleases; but what I particularly insist on is, that he will allow me to use the *common* words, *fertility* and *manure*, in my own way, and that he will not confuse them by nice distinctions, showing wherein they differ from humus, geine, or ammonia. In the piece commented on, it was not my object to inquire if the word *fertility* implied more or less than these terms; but simply to state that the learned men whose names I mentioned ascribed the fertility of a soil to the presence of one or other of these ingredients.

Having settled these preliminaries, I will at once proceed to the matter in controversy. And what is it? Mr. Peyton and the editor seem both to have fallen into a mistake on this point. This makes it necessary that I should more particularly "define my position." Both of these gentlemen go upon the suppotition that I am opposed to rotations of *every kind*, and under *every circumstance.* This I plainly and positively deny; nor is this inference fairly deducible from any part of my published piece. I hesitate not to avow that I am opposed to rotations for the common, and, as I think, *universal* purposes for which they are resorted to. And what are these? To *increase* a fertility which already exists, or at least to maintain it, or, in other words, to make the subsequent crop *greater* than the preceding, or at least equal to it. Hence it is, that in nearly or quite all the treatises I have seen on this subject, of which there have been a great many in the Farmers' Register, the

writer almost invariably concludes in language to this effect—that, "under this system, my land is constantly improving." Indeed, I can conceive of no valuable purpose which can possibly be answered by a rotation, unless it be one or the other of those stated above. Now the position which I take at this time, and which I took in my published piece, is that all crops, grain, grass, and of every other kind, *when removed from the soil*, are exhausters, some to a greater and others to a less extent, but generally in proportion to the amount removed. This position I regard as almost self-evident. If there be any axiom in agriculture, I think this ought to be one. For what is it that has wasted away the fertility of our lands, until in many instances it is almost totally destroyed? Is it not that constant and injudicious *cropping* to which they have been subjected—taking off every thing that we could lay hands on, and supplying nothing in return? Here, then, is an evil inflicted upon the land, and it is *cropping* that has done it. Now can it be conceived that *subsequent* cropping will repair the injury of *previous* cropping? I will believe this when I can prevail on myself to think that the right way to repair a theft is to go and steal more. Or, as in this present controversy, Mr. Peyton gives me a drubbing, and, by way of soothing my pains, and thus repairing the injury, the editor steps forward and gives me a more severe one. "*Noli me tangere*"—here is Latin, but I will translate it—"hands off, if you please." This, then, is one respect in which I am utterly opposed to all rotations; and I must remain in the same mind until the ingenuity of these or other shrewd farmers can convince me that one injury can be repaired by another. "*Judæus Apella credat, non ego.*" This Latin is a little harder than the other; I therefore leave it to *Mr. Peyton* to translate. I am also utterly opposed to rotations on the score that there are in the soil certain ingredients which may be so taken up by any one crop as to leave the soil in a state unfit to reproduce that same crop. If there be any exception to this, it is perhaps a crop of flax. But Mr. Peyton tells us "that a single swallow does not make a summer." Here then is proof *positive*, that absolute reliance cannot be placed upon a single exception; or if this proof is not already strong enough, "my Lord Coke" will help it out. But when I speak of a soil, I of course mean a *fertile* one; for a poor exhausted soil will produce no crop of any kind. This, if I understand him, is the main ground on which Mr. Peyton relies in his plea for rotations. In support of it, he states it as a notorious fact, that lands in his section of country, when so exhausted that they will not produce *grain* enough to pay for the cultivation, will nevertheless produce large crops of *clover*. Old tobacco lots also are restored in the same way. Liebig also helps him out with a case in which some one near Göttingen, (a great way off,) by raising a crop of wormwood, so exhausted the soil of its potash, that "it refused to bear grass for many years." Now, here is a hard case, Mr. Peyton, Liebig, the Göttingen farmer, and, what is much harder still, *facts* against me. And what shall I do with it? I will try to dispose of the *facts*, and if I succeed in this, I will leave Mr. Peyton, Liebig and the Göttingen man to dispose of themselves.

The first fact is that lands near the Big Lick, in Roanoke county, (mark the position,) when they refuse to produce grain, having, as I suppose, parted from all the peculiar ingredients fitted for that crop, will nevertheless produce large crops of *clover*. Now, although my present location is so near a city that I snuff the smoke of it every time the wind sets strong from that quarter, yet I happened to be born and reared to a large youth in a county adjoining the one which numbers Mr. Peyton among its citizens, and therefore I know "a thing or two" about these very lands. It is true that I do not know the *particular farm* which Mr. Peyton occupies; nor have I the pleasure of knowing that gentleman himself, but I speak of the general character of the lands in that neighborhood; and I do know that they were originally exuberantly rich. They are a part of those "valley lands," which have a limestone foundation for their substratum; lands, as is proved in Kentucky and Pennsylvania, peculiarly adapted to the grasses, and to the growth of clover in particular. I have even seen clover growing luxuriantly in the woods on those lands. Indeed clover, although one of the artificial grasses, seems almost indigenous to that soil. It really seems almost as natural for clover to grow *there*, as for crab-grass to grow *here*. Now, in a soil naturally rich, and at the same time naturally disposed to produce clover, I am not surprised that it should grow, and grow vigorously, on a soil which refuses to produce an article to which it is not so congenial. The old worn-out tobacco lots are recruited, I presume, in the same way, and on the same principle. And as to Liebig's Göttingen farm, (I wish it was near enough for me to visit it,) it proves just nothing at all, or, if possible, *less* than nothing. It seems that a man, in his eagerness "to obtain potash, planted his whole farm with wormwood." Whether he got a crop or not, we are not told, and we are not told a great many other things which, in a matter of authority, I should like to know; but I presume he did get one, for he so ruined his land that it refused to bear grass for several years. Refused to bear *what?* We are told *grass*. But grass was not the last crop that it produced! When I came to this, I thought that Mr. Peyton must have made a mistake in his quotation, or that the *printer* must have made one. But no! All is right. Liebig says that, after producing the wormwood, the land refused to bear *grass*. Now why a rotationist should refer to this as authority, I cannot conceive. *Wormwood*, surely, is not the same thing as *grass*. In *appearance* they are very different, and in *taste* still more so. Why, then, should the *wormwood* incapacitate the land to bear *grass*, a thing so different from itself? But it seems that the potash was so taken up by the wormwood, that none was left for the grass. Potash, then, cannot be one of the *peculiar* ingredients which is necessary to one crop and not to another. Here it was necessary to at least *two* crops, and, for aught I know, equally necessary to twenty crops besides. And so it falls in with my theory, that the same ingredient, which I have taken the liberty of calling *fertility*, is just as necessary to one crop as to another. With this statement, I am at no loss to account for the failure in the man's grass crops. The wormwood exhausted the lands not only of their potash, but of their *fertility*, a thing which in my estimation is

of much more importance. If the man, instead of puzzling his brains about the deficiency of potash, had only gone to Liebig and got some of his ammonia, and applied it pretty liberally, I doubt not his farm would have produced heavier and better crops of grass than they ever did before. Give me therefore this one peculiar ingredient, *fertility*, and I care not a fig for all the other peculiar ingredients put together.

But I have a little more to say about this Göttingen farmer, so much relied upon as authority by your correspondent, Mr. Peyton. According to Liebig's account of him—and this is all I know—I suspect that he was but a very poor farmer after all. He risked the productions of a whole year upon a *single* crop! Now I never knew even a *gambler*, rash and fool-hardy as gamblers commonly are, to risk his whole stake upon the cast of a single die. I wish the man had tried wormwood a second time, when he failed in grass. But I suppose that Liebig had drilled him too well in the doctrines of rotation, for this.

There is another reason why I am opposed to this peculiar ingredient system; and that is, that, in my present circumstances, I should find it too expensive and too troublesome to practise upon. On this plan, as I am not a chemist, I should have to employ one; and as Liebig stands higher in authority than any other man, I think I should prefer him. I could get Macaire Princep, or De Candolle, or some other Frenchman, perhaps, a little cheaper; but still, for certain reasons, I think I should prefer Liebig. Now although, as I have had occasion to state elsewhere, the income of my farm is pretty considerable, still I fear that the increased income would not pay his salary. This, then, would be but a bad bargain. In fact, I doubt if the *whole* income of many farms would be sufficient to pay him. *What* then should I, and others situated as I am, do for our chemist? I am aware that this objection does not lie as it respects Mr. Peyton; for I see from his communication that *he* is a chemist, and therefore need not employ one. But I, and perhaps more than nineteen-twentieths of the other farmers of Virginia, would each have to employ one, or at least one for every neighborhood. And the reason is simply this, that before I could venture with any prudence to plant my corn or sow my wheat in any field, I must first ascertain if that field contained the peculiar ingredient, and in that peculiar quantity, which are necessary to insure a crop. See how much Liebig's Göttingen farmer lost by not employing his chemist—his whole crops of grass "for many years!' Why this would ruin *me*, body and estate. But, jesting aside, it would really gratify me to see this visionary scheme carried into actual operation. And if Mr. Peyton will establish a farm on this principle—and, being a chemist, he is the fittest person that I know of to do so—I will leave my smoky atmosphere, and, with his permission, visit it. Such a thing appears very well on paper; I wish to see how it looks in practice. In fact, I have been a dyspeptic for nearly the last twelve months, and should be glad of an apology to visit the salubrious mountain region that he inhabits. How delightful, then, on such an excursion, to visit a field cultivated on this scientific plan—corn here, potatoes there, wheat, rye, oats, beans, pumpkins, turnips, not forgetting wormwood, every thing arranged in scientific order, according as the peculiar ingredients can be found, which are suited to each particular crop!

Now *my* theory on this whole subject is so simple and plain, that I am rid of all this vexatious trouble and expense. There is no chemist, except the cook, on the place, and yet we get along pretty well. Grass, it is known, is my main crop, and as I plant no wormwood to exhaust the potash, I have had, with the exception of one unusually dry year, very fair crops. I go upon the simple principle, that every crop of every description which I take off, and appropriate to my own use, is injurious to the land. If I see any field, or any part of a field, beginning to fail—and this I see much more frequently than I wish—I never send for a chemist to tell me what is wanting. I already know that it wants *fertility*, and this want I endeavor to supply by *manure*. And in the applications of manure I never trouble myself to inquire what *special* ingredients it contains—whether humus, or geine, or ammonia or silicate of potash, or phosphate of lime, or "a thousand and one" other hard names infinitely more familiar with Liebig and Mr. Peyton than they are with me. It is enough for me to know that these manures impart to my land *fertility*—"the one thing needful" to every crop.

But Mr. Peyton states another strong case upon the authority of Macaire Princep, and "alluded to by Liebig, in which *leguminosæ* (beans, reader) are represented as having so filled the water in which they grew with their excretions, that a second crop would not grow in the same, whilst corn plants grew vigorously in the liquid;" and he calls upon me by name to account for this strange phenomenon. This case, I frankly confess, is too hard for me. I have planted beans, it is true, and I have a very flourishing crop of them in my garden at this time, but I never plant them in a *liquid*. I always plant them in the *soil*, just as I plant corn or potatoes, or any thing else; and if the soil is a fertile one, and I cultivate it well, I never have any trouble about their growth. I beg leave, therefore, to refer this strange affair, and all others of a similar character, to Liebig, or Macaire Princep, or some other of the chemical fraternity. Mr. Peyton tells me that the "genius of De Candolle revived and illustrated" this very thing. Liebig afterwards "modified it," in some slight degree; but I suppose the gentleman is not satisfied with the modification, and therefore calls on me to modify it still further. Really, sir, I would like to gratify you, but this whole affair is too *refined* for me. I never plant beans in the way these gentlemen speak of, and therefore know nothing about it. But if you must have a further modification, I think it more than probable that the very next writer on chemical agriculture will *modify the whole away*, and then at least *one* of us will be gratified.

And here, I will take occasion to say, is the foundation of all the objection that I have to scientific agriculture, or to farming on scientific principles. A chemist takes a vessel from his laboratory, in it he pours water, and in the water he puts some beans, just as I have seen my wife (she is a great florist) place her bulbous roots in flower vases, containing nothing but water and perhaps a little cotton to support the roots. In a little while the beans vegetate and show some disposition to grow. After a while the water be-

comes discolored. The first beans are now taken out, and others are put in the same liquid. These latter will not grow, but corn plants grow vigorously! And what can be the cause of it? *Some* cause *must* be assigned, and, for a better, here it is. The first beans so poisoned the water with their excrements, that the latter positively refused to grow. And this *one, solitary* experiment, tried, not in the field, but in the chemist's laboratory, and tried, too, in an element foreign to the growth of the article, is made the foundation of an extensive principle, which is to give a new aspect to the whole science of vegetable physiology! From the time of the first farmer, down to the time that this experiment was made in a chemist's shop, it was a matter of universal notoriety that, *provided* there was sufficient fertility in the soil, a *second* crop *would* succeed a first; but now it is found that the first crop so poisons the land by its excrements that the second will not grow. And so all the previous facts, which were so well established, must be made to yield to this one solitary instance. It is to *fooleries* of this character that I am utterly opposed; but to sound science, brought to the test of practical utility, and found pure, I am as decided a friend as can be found in America or Europe either.

But I am losing sight of my subject. Having now shown that I am no rotationist, either on the *peculiar ingredient* system, or for the sake of increasing, or even maintaining, a present fertility, which, by-the-by, as I still think, fairly covers the whole ground, I will proceed to state, that I advocate a change of crops, whenever I can make a greater profit by so doing. The *profit*, then, is the leading idea, by which I am governed in this thing. In illustration of this, I will suppose that there is a piece of ground just recovered from the forest. I will not sow grass, or wheat, or any other broad-cast crop there, because it is certain that with the soil unbroken, and the large quantities of litter on the ground, the seeds would not vegetate, and therefore a crop could not be reared. But I will plant corn, or tobacco, or some other crop there, which I can cultivate on the plan of drill husbandry, and in this manner may ultimately so cleanse and pulverize the land as to make it more profitable in a broad-cast crop. Or, there is a field which has borne several crops of grass: this field is now so filthy that it does not yield a profitable crop; at least the crop in something else would be *more* profitable, paying me at the same time for the labor of changing the crop. As a matter of good management, then, I would root up the grass, and substitute its place with that other crop. But this is not rotation. It is merely a change of the crop, not to effect any of the purposes of a rotation, but to make the land with its cropping as profitable as possible. If the field would yield a fairer profit in grass than in any other crop, I would continue it in grass for ever, and so of other crops.

And now I hope I have fully "defined my position" on the subject of rotations, and here, perhaps, I ought to drop Mr. Peyton. But there is another little matter to which I must call his attention. And, first, I am pleased that he had the courtesy to append his own proper name to his strictures. I have read these strictures with no unkind or even indignant feelings. The whole style of his piece shows that he is a scholar and a gentleman. I am not *certain*, but I suspect that my unknown antagonist is a *young* man. I like to see ardor and boldness in youth, but the gentleman will excuse me for saying that these qualities usually give place, in after age, to caution and modesty. With these remarks, I will call Mr. Peyton's attention to two sentences, in which I think he has done me injustice. I will not quote the objectionable sentences entire, but simply call his attention to them. He says, "Mr. Turner sets out rather ominously, in the midst of a strange confusion of technical terms," &c. Now I am utterly at a loss to conceive what can be Mr. Peyton's meaning in this and what follows. When I first read this, I thought I must have been betrayed into some incautious expression. I therefore carefully looked over the piece again; but still I cannot conceive on what this assertion is founded. If Mr. Peyton will have the goodness to point out that "strange confusion of technical terms," I will in disgust and mortification blot it from my manuscript. A little further on, he charges me with an attempt to "varnish," &c. Now all my positions are so plain, and all my illustrations are so simple, that I need no varnishes to cover their defects.

The other objectionable sentence occurs near the beginning of the strictures. It is there said, that from my "successful farming and well-written communications," &c., and then it is more than insinuated, that I am trying to pervert my influence to the injury of my brethren. To this grave charge, I again plead "not guilty." But even if guilty, I am consoled with the fact, that there is such an *able* opponent to make the antidote commensurate with the bane. With these remarks, and with the kindest feelings, I take leave of Mr. Peyton.

But my work is only half done. A new adversary presents himself, and a new scene opens before me. I leave Mr. Peyton, Macaire Princep, Liebig, and other literary characters, to settle their own grave concerns, in their own way, but it is only to encounter the formidable editor of the Farmers' Register. I leave the field of science, but, strange to tell, wearing a black coat as I do, it is to enter the field of chivalry!

And now I have an adversary of a different order to contend with, old, experienced, sage, cautious, a *veteran* in the cause, with courage sufficient to make a bold soldier, and with prudence to moderate it. I think, however, that he shows more boldness when he has some associate in arms to lead on the attack, than when he comes to the conflict alone. Such is the adversary with whom I now grapple.

And here, passing by that pretty figure about knight errantry, and "knight challenger, and Le Noir Faineant," and "all that sort of thing," which it seems was so pretty that the editor could not resist it, though in availing himself of it, he makes me appear a little ridiculous—also, passing by all that he says about the universality of rotations as practised by judicious farmers, I come at once to the main thing in hand. But first I wish to say a passing word about this "knight challenger," whom the editor introduces with such a flourish. And if he means *me*, I must remind him that I was enjoying a peaceful retirement at my farm, until he came in and *tempted* me from it. We read in the good book of two other persons, who were enjoying a simi-

lar retirement at their quiet retreat. But another tempter came in and lured them from it. If then *I* am "Le Noir Faineant," *who is the editor?*

Now the editor is very slow in coming to this contest, but as soon as he finds that he has a gallant associate in arms, who will lead on the attack, he comes to it very boldly. Disdaining all aid from the Frenchmen and all other scientific authority, in the confidence of his success, he boldly rests his whole argument on two points. "Mr. Turner is an intelligent, observant, practical and successful farmer." Mr. Turner is in favor of rotations, and I cite him as my witness to prove it. *Nature* also alternates her crops. Therefore rotations are necessary—Q. E. D. But not so fast, Mr. Editor, let us look into this thing a little.

It is true that I do practise a change of crops, not from choice, but from necessity; and in a preceding part of this paper, I have stated the *extent* and the reasons *why* I do so; and the editor may make the most of it. But the editor, using me as his witness, says, that "Mr. Turner's statement of his own herds-grass giving way, after a few years, to green-sward or weeds, is not only a proof of this position, but of nature's urgent demand for a change of crops." Thus he brings both his arguments to bear upon the main point at the same time; and this at once opens the whole field of controversy.

But before I enter upon the subject in hand, it is necessary to premise a few things. I state then, in the most distinct manner, that I make no pretensions whatever to any thing like a *critical* acquaintance with vegetable physiology. With the exception of a few short detached pieces, I have read nothing on this subject. But I have eyes, somewhat dimmed by age it is true, and I have thoughts, and I have tried to use them also. A book has been constantly before me, "the open volume of nature," the pages of which I have made it my habit to consult more or less every day. From this book then I have learned some strange things, which I propose now to detail.

Among other things I have learned that nature and art, in all their designs and in all their operations, are as completely and as thoroughly opposed to each other, as any two things can possibly be. By the term *art*, I here mean all the operations of man in which *cropping* is concerned. Considered in this respect, light and darkness are not more really and truly at variance, than nature and art. They are not only opposed in their very *being*, but also in the whole course of their operations. Whatever, therefore, the one endeavors to do, the other endeavors to *undo*. If man digs a ditch, nature immediately begins to fill it up. If man erects an enclosure around his field, nature at once begins to pull it down; and if man builds a house to dwell in, nature directly begins the work of dilapidation upon it.

Nature and man are also directly at variance in regard to their wants. The wants of man are as numerous as the "stars of heaven or the sands on the seashore." *Nature*, on the other hand, has but one want, and that is rich fertile lands. This object she constantly pursues with the most untiring and patient perseverance. If a *weed* springs up, and nature is not counteracted in her course, she uses it to enrich the spot on which it grew. If a *leaf* falls to the ground, nature makes use of it to nourish the tree that produced it, or if a *limb* or even a *twig* is broken off, nature, with the most admirable economy, changes it into nutriment, to be employed in the same way. Thus nature with her trees, her shrubs, her weeds, her grasses, and in fact with every thing else which she has under her exclusive control, is constantly, is steadily employed in enriching her lands. But what is the case in regard to art? It is well known that the whole policy of cultivation is not to *enrich*, but to *impoverish* the land. Instead, therefore, of giving our *artificial* crops to the land, as nature does the whole of her *natural* crops, man takes them all off. And instead of enriching our lands as nature does, man constantly impoverishes them.

I observe further, that the *crops* which nature and art cultivate are just as distinct as the objects are for which they are cultivated. Nature has *her* crops, and man has *his* also; and they are as distinct as the objects are to which they are to be applied. Nature rears her mosses, her lichens, her shrubs, her grasses, called natural or indigenous, but the crop in which she seems to take especial delight, is her own forest tree. Man, on the other hand, cultivates his corn, his wheat, those grasses which are called artificial, and the fruit tree. Nature never cultivates the artificial grasses, because weeds and natural grasses answer her purpose better. If, therefore, the artificial grasses are made to grow, it is only at the expense of labor and trouble, and nature is trying all the time to destroy them. The whole system of cultivation, therefore, is a counteraction of nature, and it is a counteraction which she continually opposes.

In accordance with this we see, that when we fell the forest, nature immediately makes a strong effort to restore it. Sprouts spring up, and young trees make their appearance, so that if we fail to remove them, nature will soon erect a forest in the same place again. In the same manner, when man plants any of his crops, nature abhors them, and does every thing in her power to destroy them. Her great object is to put *her own crops* in the same place. Hence it is that a war is constantly waging between them, and this war is of the most deadly character, amounting to nothing short of actual extermination. Man tries to destroy nature's crop, and nature tries to destroy man's crop. The whole object of ploughing, weeding, &c., is merely to destroy nature's crop, and nature, with her weeds and grasses, tries to destroy man's crop. Now, the editor knew all these strange things very well when he was a *practical* farmer. But since he has laid aside the plough, and taken the pen in its stead, he has perhaps forgotten them. I therefore take the liberty of bringing them to his remembrance.

With these remarks, not one of which, I am bold to say, can be controverted, I feel, as the witness cited in the case, no difficulty in telling *why* "Mr. Turner's herds-grass gives place after a few years to green-sward, or to weeds." It is not because the land is *tired* of the herds-grass and requires a rotation; but it is simply and truly because herds-grass is an artificial grass. It is one of man's crops. Nature therefore abhors it, and does every thing in her power, from the very beginning, to destroy it. If herds-grass

had been less hardy, less tenacious of its hold, nature would have effected its destruction at an earlier period. As it is, it required three years to accomplish it. But what are three years or three thousand years in the account of nature? Green-sward on the other hand is a natural grass. It is one of nature's crops, and one of the uses which she makes of it is to destroy man's artificial crop.

But this argument, to be worth any thing, must go a step further. If herds-grass yields to green-sward because the land is tired of it, or because it has taken up all the peculiar ingredients in the soil which are fitted for it, as the editor and his associate intimate,* and therefore requires an alternation, then, for the same reason, in three *more* years, the land ought to be tired of the *green-sward*, and the green-sward ought in its turn to yield to the herds-grass. But this I utterly deny, and the editor dare not avow it. Nature has her various grasses, but this seems to be her favorite. When therefore I see my herds-grass yielding to green-sward or weeds, which unfortunately is too frequently for my comfort or profit, I ascribe it, not to a propensity to alternate, but to that *struggle* which nature is continually making to destroy my artificial crops, and it seems to me that the editor must in candor ascribe it to the same.

But if the editor will favor me with a visit, I will show him an argument much more in point, and much stronger in force, than the one he has adduced. Last spring I planted my corn about the usual time, perhaps a little earlier, and during all its early stages cultivated it well. But for the last four weeks we have had an almost constant succession of cloudy weather, attended with frequent showers of rain, some of which have been very heavy. The consequence is, that our ploughs, cultivators and hoes, have been almost entirely banished from the field, and the whole field, from the excess of grass and weeds, presents at this time the most mortifying aspect. But what can be the reason of this? "Oh, I can tell," says the editor, "and I cite Mr. Turner as my witness to prove it, the land is tired of the corn, and therefore seeks to alternate it." What! *tired in three short months*? Or is it not, as I stated, that nature with *her* crop of grass and weeds, is seeking to destroy my crop of art, and has taken advantage of the unusually wet season to effect her purpose?

But it was stated some time ago, that nature's great and favorite crop was the forest tree. Indeed the chief and prominent object of nature seems to be to cover the whole face of the earth with her trees. She has them of the greatest variety, and she plants and nurtures them in every practicable situation. *Some* grow even in the water, and I have seen them growing also on the hard rock, where there was but a scant supply of soil to sustain them. Indeed I think it not improbable, visionary as it may appear, that large sections of land in the "Valley of Virginia," now covered with forests of immense trees, were once nothing but a naked lime-stone rock. How else can we account for the remarkable shallowness of the soil? Now I do not say that nature planted her trees originally on the naked rock. She was too skilful a manager for such a blunder as that. But, in the first instance, she planted what *could* and actually *did* grow there, viz.: mosses and lichens. With these, using the lime to decompose them, she first formed a little thin soil. Here was a beginning. Afterwards she probably employed grasses, first of the lower and then of the higher orders. After this shrubs, &c., until, in the long lapse of time, she accumulated soil enough for her favorite crop, the forest tree, and then she planted it. And now she has the crop to which all her efforts were directed from the very beginning.

Now here I have supposed an extreme case, from no soil at all, there has been soil enough formed to sustain the forest tree. In bringing about this result, great changes have taken place, the moss has yielded to the grass; the grass to the shrub, and the shrub to the forest tree. And do not these changes prove rotation? Not at all. On the other hand, I fearlessly affirm, that *not one* of these changes was made for any of the purposes of rotation; but they are all to be regarded merely and solely as so many preparatory steps towards nature's final crop. You might as well tell me that ploughing, harrowing, manuring and planting are so many rotations, as that the preparatory measures adopted by nature, with reference to her crop, are so many rotations. Nature, it is true, has no stable nor farm-pen to furnish manure. Nor has she a plough, or hoe, or spade, with which to prepare her lands. But still she has her own resources, decaying vegetation, and the frosts of winter, and these she employs in the most untiring manner, until she brings her lands into the proper state to receive her crop, and then she plants it. All the gradations, however, from one material to another, in the mean time, are not to be regarded as so many rotations, but simply as so many links in the great chain of preparation.

We will now suppose that the great business of preparation is at last completed, and that nature's grand crop, the crop in which she seems to take special delight, the forest tree, is actually planted. The question is, does she ever change it? The editor affirms, but I deny; and thus we are directly at issue. But the editor demands, when the forest of oak has been removed, and another forest grows up, is not the latter different from the former? True! but whose work is this? Is it nature's? Did nature destroy her own forest of oak? Or rather, did not man destroy it? Here man came in, and interfered with nature in her steady operations. He violently took away the crop in which nature glories, and he substituted his own artificial crop, a crop that nature abominates in the place of it. This crop he constantly appropriated, year after year, to his own use, returning nothing to the land which produced it, until fertility is destroyed, and positive impoverishment has been fixed upon it. In this state, he gives the land back again to nature. And how does nature manage it now? Does she put the same crop on it as before? By no means. She has too much skill for this; but finding the land in a very different situation, she varies the crop according to the different circumstances in which she finds it, wisely adapting her

* This is a mistake, as to the editor. The doctrine may be solid, or it may be groundless; but we neither assumed it, nor referred to it.—Ed. F. R.

crop to the present impoverished situation of the land. The change therefore, from the hard wood to the soft, is not properly an *alternation*, it is merely a change brought about by the peculiarity of the case. If I have a piece of land so poor that it will not produce turnips, and I plant peas there, is this an alternation? No one will pretend that it is. No more can *that* be regarded as an alternation, when nature, finding that her land will not produce the former crop, plants a different one on it.

Having now disposed of the case on which the editor seems to rely with so much confidence, I go a step further and say, that nature *unviolated*, but let alone in her own free course, *never alternates her crops*. Go to some sequestered spot where man has never been, if such a spot can be found, and where violence of no other kind, by tempest, by flood, nor by fire, has ever been inflicted, and the forest which was of oak, a thousand years ago, is a forest of oak still. I insist upon it, that no instance can be adduced, in which nature, left to her own free course, has been known to alternate an oak for a pine, or a pine for an oak. Such changes do constantly occur where *man* has been at work, but then the handy work of man has been the cause of it.

Furthermore, if the editor will favor me with a visit, (I am too busy at this time to visit him,) I will show him, what it seems is a strange sight in his section of country, and I suppose will be equally strange to his associate, Mr. Peyton, also, and that is not *one* young oak, but *great multitudes* of them, growing from the decaying stumps of the parent tree, and nourished by what I call the *humus* of the same. It seems that no such thing ever occurs in the editor's country; but there, when a tree dies in the natural way, or is uprooted by the storm, or destroyed by fire or inundation, it is succeeded by a tree of different order. Even the long-leafed pine, or the short-leafed pine, is succeeded by the old-field pine—a tree of different order. Now *here*, I assure the editor that I witness the *fact* as stated above, and I venture to assert that it will be found to exist in a great many other places. Changes of this character, I admit, do often take place, but rarely, if ever, except where a change has been effected in the condition of the land. Let the land remain the same, and leave nature to work in her own way, and the forest, which is her main and final crop, will remain the same. If under these circumstances the oak dies, another oak will spring up from the stump to supply its place.

I will also mention that along the fence which divides my neighbor's land from mine there is a line of locusts planted. These locusts send their roots to a considerable distance into my field, and thus I am plagued every year in grubbing up the young sprouts which issue from them. There is also an Otaheitan mulberry standing in the corner of my yard, (I wish it was somewhere else,) which has extended its roots into the garden and the adjoining field; and here also, I have no little trouble in keeping down the young shoots. It is also notorious, that the aspen is remarkable for covering the whole space occupied by its roots with a multitude of *young* aspens. But I shall be told—these all proceed from the *roots*. I know it; but I ask, in my turn—why do not these roots so exhaust the peculiar ingredients fitted for the tree, as to render the land incapable of rearing the same? If in these cases the locust was cut down, would a mulberry spring up? Or if the mulberry were cut down, would an aspen take its place? Or if the aspen were removed would a pine make its appearance?

But *I* am exhausted, though my *subject* is not. This business of meeting two such formidable antagonists at once, *though* in separate order, is hard work. I must, however, say something about the admirable economy of nature in compassing her main object. I have elsewhere stated, I think in the piece commented on, that nature has but one want, and that is *rich lands*. All her efforts seem to tend to this one point. She abhors the idea that there should be a barren or unproductive spot in any part of her vast farm. We have seen that she will even take the naked rock, and first clothe it with verdure, and then plant the grand forest tree there. And how does she effect this? It is simply by husbanding all her resources, and then, with an admirable skill, turning them to the best account. Nature never wastes any thing. Not a weed, not a leaf, not even a bit of moss is thrown away by her. In her *productions*, also, we see this wonderful skill displayed. She produces but little *fruit*, for she has no use for it. Whilst this is the case, it is wonderful what a multitude of *berries* ornament the plants, the shrubs and the small trees of nature. For these she has a use, and that is to feed the immense numbers of her beautiful birds. But man can gather ten times as much fruit from one of *his* small trees, as can be gathered from one of nature's huge oaks. But if nature be deficient in the production of fruit, she is by no means deficient in providing the means by which she may enrich her lands. If, therefore, the oak produce but few acorns, it produces a large crop of leaves; acorns also often fail, but leaves never.

The above may perhaps be regarded as mere fancy. Not so. I have a distinct object in stating it, and that is to illustrate further what I have said about that deadly warfare which nature is carrying on upon the cultivation of man. She regards the whole world as her property. She claims every acre, every inch of the land as her own. Her main, her constant object, an object which she has pursued for thousands of years with the most untiring perseverance, is to make every foot of the land *rich*. This she does by taking off nothing, but restoring the whole product, weeds, grass, leaves, to the land. Now the very tendency and policy of cultivation is to defeat nature in this her favorite object, and this, in my opinion, is the cause of that *deadly* grudge which she owes to man.

This then is my theory of vegetable physiology. And now, Mr. Editor, what think you of it? I did not learn it from Macaire Princep, nor De Candolle, nor Liebig. I left these gentlemen, you recollect, some time ago, discussing with your worthy associate about a second crop of *beans* refusing to grow in water. *I* am, for *my* part, much more surprised, that the *first* grew, than that the *second did not*. However, it was a *grave* matter among them. One *started* it, a second *revived* it, and the third *modified* it *a little*. If your associate can leave these gentlemen for a moment, I will say to you singly or jointly, that if you choose to leave this discussion *here*, I am

content. But if you or he, or both of you, throw down the glove, I cannot, as the "knight challenger," Le Noir Faineant, refuse to pick it up.

But before I dismiss the editor, I must say one or two more things to him. One of the reasons assigned why he did not earlier oppose my "heterodox" opinions on the subject of rotations, is that he is "already engaged to oppose me upon one particular ground of controversy, which could not be avoided." This allusion I suppose is to the subject of liming. Now why he has not already met and opposed me on this subject, I cannot tell; unless indeed, he is waiting for some more daring knight to bring on the attack. The editor also intimates, in another place, that I have "shifted my ground" on this subject. This I regard as no charge at all. I have, upon further thought, and under the influence of sound argument, shifted my ground more than *fifty* times in the course of my life. And if the editor or his associate, either singly or jointly, can convince me that the positions taken in this paper, or in any of my papers, are wrong, they will find no one more ready to shift his ground, than their humble servant,

J. H. TURNER.

[We have no desire, nor indeed is there any ground left, for continuing this discussion; for not only does Mr. Turner's practice, (as before adduced,) but also his reasoning, (as now presented,) go to sustain our own position in favor of rotation of crops. The only reason for rotation which we assumed in our remarks, (though not the only one which might have been maintained,) was, that one kind of crop prepared the land better for another kind, and that when so changed, the products and the profits would be greater than by continuing any one kind of crop. This Mr. Turner as fully maintains, and therefore we are altogether in accordance on this, which is the main question.—ED. F. R.]

NATURAL CHANGES OF THE KINDS OF SUCCESSIVE GROWTHS OF TREES.

[In the preceding number, reference was made to this subject, and some general facts stated in proof of the truth of such natural and entire changes. The following extracts, from communications to the Philadelphia Agricultural Society by the venerable Judge Peters, and from the letters of some of his correspondents, are presented as more particular evidence and better authority, for such of the facts as are not notorious here.—ED. F. R.]

Extract from a communication by Judge Richard Peters. (Memoirs, Phil. Agr. Soc. vol. i. p. 28.)

"There is an account in the public prints of the general decay of the *pine-woods* in South Carolina; effected by a disease, which commenced in 1802. It would be highly useful to ascertain and record the facts, relative to this catastrophe. It has fallen under my observation to know, that this phenomenon is not rare, or singlular. Intelligent surveyors, who have been occupied in running out new lands, in Pennsylvania and other states, remark, in a variety of instances, a total change of timber, in many extensive districts of the wilderness. They discover by the fallen timber, coated with a diversity of the *mosses* (by which the air, and other means of decay, being excluded, they were the better preserved) that the present forest trees are entirely different from those of the former growth. Those prostrate are, in many instances, of the resinous tribe, where those of a totally different kind are now growing, of enormous dimensions; in sites where white pine, pitch pine, and hemlock had formerly possession; so that the living timber must be very ancient. The largest trees majestically flourish among the fallen trunks of their predecessors. Those of us who have traversed our distant forests, especially beyond the mountains, where the timber is truly gigantic, must have noticed this striking circumstance. The variegated verdure of these immense recumbent trunks, numerous and extensive, affords to the traveller a curious, pleasing, picturesque, and stupendous contrast, with the dusky glooms of the shades surrounding him.

"In my memory, on a smaller scale, a total change of timber has occurred, in a tract of mine, containing about 800 acres, in Northampton county. Previously to our revolution, perhaps 35 years ago, I knew it to be covered with *pitch pine*. It was called the *Pine Tract*. This first growth of timber having been blown down by a tornado, was consumed by fires of the woods, a practice mischievously common in that quarter. It is now entirely reclothed with *oak*, *hickory*, and other valuable well grown and thriving timber; and scarcely a *pine* tree is to be seen. I can give (within my own knowledge) several instances similar, but of less extent. One, of a fine grove of *white pine*, thrown up spontaneously, on old fields, where no timber of that species had originally grown; and far from any such timber. Another, of a large body of valuable *chestnut*, where a person, now living, has reaped wheat and other grain; and where *hickory* and *oak* had been the precedent growth; and no timber but of the latter kinds, is now to be seen in the adjacent lands. May it not therefore be probable, that a change in the timber of the southern country is about to take place? Dissolution and renovation, are constant operations in nature. Some whole races of animals have become extinct. The *mammoth*, the former monarch of the woods, is a proof, in the knowledge of every body. Beasts of a very different race now occupy his haunts. Yet this has excited more curiosity, than important research, or useful inquiry.

"I do not find that the particular species of timber growing on land, invariably designates its qualities, or strength; although it is certain, that some kinds are the most frequently found, on lands of similar quality. I have known *hemlock*, white *pine* and pitch *pine*, grow on very rich, deep stapled, and strong land; as well as on the most sandy, thin and sterile soils."—p. 37.

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"Since this communication, I have met, acci-

dentally, with a critique in the *Edinburgh Review*, vol. i. 1802 3, on *Mackenzie's Voyages*. It calls to my recollection a confirmatory fact, mentioned by him. He alleges it to be "a very curious and extraordinary circumstance, that land covered with *spruce pine* and *white birch*, when laid waste by fire, should subsequently *produce nothing but poplars*, where none of that species of tree was previously to be found." The reviewers speak incredulously of this fact, which is nevertheless undoubtedly true; and corroborative of similar relations. Many of the *phenomena* of nature pass so often without notice, that they appear incredible, when our attention to them is awakened."—p. 37—8.

Dr. James Mease adds the following:

"The cause of the rapid and alarming decay of the pine timber in South Carolina, is an insect or bug which was first observed in the northern and eastern parts of the state about six years since. It is a small black winged bug resembling the weevil, but somewhat larger. A great number of these bugs have been observed in the spring of the year, and early in the summer, flying near the roots of the trees; they pierce the bark a little distance above the ground, and lay their eggs between the bark and wood; in a few weeks after, these eggs hatch, and a worm appears, which, at its full growth, is about an inch long; they immediately begin to feed on the sappy part of the tree, and do not cease eating until the whole of it is destroyed.

"Very considerable injury has been done by these insects to the pines of South Carolina. In one place, viz., on the Sampit creek, near Georgetown, in a tract of two thousand acres of pine land, it has been calculated that ninety trees in every hundred have been destroyed by this pernicious insect; the adjoining lands, and many tracts on the Santee and Black rivers have equally suffered. The fact of an oak springing up in the place of a fallen pine tree, and of the latter appearing when the former is cut, in the southern states, is known to every one there."—41.

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"Mr. Hearne says, that 'strawberries of a considerable size, and excellent flavor, are found as far north as Churchill river, and that it is remarkable, they are frequently known to be more plentiful in such places as have formerly been set on fire. This is not peculiar to the strawberry, for it is well known, in the interior parts of the country, as well as at Albany, and Moose forts, that after the underwood and moss have been set on fire, raspberry bushes and hips have shot up in great numbers on spots where nothing of the kind had ever been seen before.'—*Journey to Northern Ocean, page* 452. *Lond.* 1795.

"Mr. Cartwright also observes, 'that if through carelessness of those who make fires in the woods, or by lightning, the old spruce woods are burnt, Indian tea is generally the first thing which comes up: currants follow next, and after them, birch.'—*Journal of Transactions at Labrador. Vol.* 3. *p.* 225.

"The following extract of a letter to the writer, from John Adlum, Esq., of Havre-de-Grace, Maryland, dated September 16th, 1807, is a further confirmation of the point here in discussion. Every one who knows the high authority of Mr. Adlum, as an accurate observer, will duly estimate the facts he details.

"'As to your query respecting a rotation or succession of forest trees, I am as well satisfied of it, in my own mind, as if I had lived to see the whole change for centuries back; and although it may be difficult to give the kind of information, that may be satisfactory, I have no doubt that I could convince any person as to the fact, were he to travel over the country with me.

"'I first took the idea in the summer of 1788, when I was surveying lands south of the great bend of Susquehanna, between that river and the Delaware, in what is called the beech and sugar maple country. In the course of my surveying, I traversed some places, consisting of a few acres each, growing red and white oak trees of an enormous size, none being less than sixteen feet in circumference, five feet above the ground, and generally from 40 to 50 feet to the first branches; some few red oaks were 22 feet in circumference, and the white oaks 20 feet round. I was struck with astonishment to meet a few trees of the oak kind, considering that I had not seen any for some weeks. After discovering the first few, I kept a look out for more such places, and as well as I can remember, I found two more of the same kind, containing trees of the same enormous size, but no small oaks nearer than the large waters emptying into the Susquehanna and Delaware. The places mentioned, were near the heads of those rivers, and where the streams were small, I invariably found small bodies of very large hemlock (*Pinus abies Americana*) trees, (the prevailing timber,) near those places; the remainder of the trees consisted of beech, sugar maple, with a few white walnut, (*Juglans alba,*) white ash, birch, &c., but no oaks.

"'In those parts of the country, where the prevailing timber consisted of sugar maple, beech, and birch, I observed large trees growing as it were on stilts, their roots being three feet above the ground, which trees undoubtedly grew on old logs that had either fallen with age, or had been thrown down by hurricanes, and had rotted away from the roots of the trees."

"'The clumps of oak and hemlock are generally in the midst of, or surrounded by large bodies of beech and sugar maple lands, mixed with some ash, and a few wild cherry and hemlock trees. In some parts of the country, the prevailing timber is still hemlock, on the sides of hills, and along streams.

"'From the circumstance of the great size of all the oak trees growing in the spots noted above, it appears to me that most of the high country, including the head waters of the Delaware, Alleghany and Chenesee rivers, was originally an oak country. The hemlock appears to have succeeded the oak, for there is still a considerable quantity of that timber over the face of the country, but from the number of logs of it lying on the ground, and its visible decline, I think the beech, sugar maple, &c. succeeded the hemlock, as they are the prevailing timber at present. The timber that appears to me will take place of all others in the country before mentioned, is the white ash and wild cherry, for I observed that all places where the woods have been blown down by hurricanes for a number of years back, the young growth consists principally of those two kinds of trees,

and the largest saplings of them which I saw, were six to nine inches diameter. I suppose that the appearance of the latter trees commenced between twenty and thirty years back, counting from 1794 or 1795. There are several of those wind falls, in the remote parts of Pennsylvania and New York, near the line dividing the two states; they are generally 1-8, rarely 3-4 of a mile wide, and several miles long, and in every one that I saw, and that did not appear to have happened more than from 20 to 30 years ago, the ash and wild cherry were the prevailing timber; there were indeed other trees growing among those, but from their appearance very few of them would attain to a large size except some birch, and I have no doubt, that if cultivating the country does not make some alteration in it, in another century, the beech, sugar maple, hemlock, &c. will be as scarce in those parts of the country, where they now abound, as the oak is at present.'"—42—45. * * * *

A later communication to the same publication from Judge Peters furnishes the following passages:

"In a conversation with Mr. Rembrandt Peale, who adds to talents promising to render him greatly eminent as a portrait painter, a knowledge of natural history, in some of its most curious branches, the subject of changes of timber was mentioned. He informed me of the circumstances attending their search for the bones of the mammoth, in Orange and Ulster counties, in the state of New York, in 1801. He was so kind as to gratify me, by presenting to me two pamphlets; accompanied by a letter, which I send for the perusal of the society. I transcribe the passage he alludes to, relating to the timber."

* * * * *

"'Many of the cavities (says Mr. Peale's pamphlet between these knolls are dry, others are in a in a state of ponds, but an infinite number containing morasses, which must originally have been ponds, supplied by springs which still flow at their bottoms, and filled in the course of ages with a succession of shell fish and the decay of vegetables; so that at present they are covered with timber, and have been so within the memory of man. An old man, upwards of sixty, informed us that all the difference he could remark between these morasses now, and what they were fifty years ago, was, that then they were generally covered with firs, and now with beech. This was verified by the branches and logs of fir which we found in digging; many pieces of which had been cut by beavers, the former inhabitants of these places, when in the state of ponds. Scarcely a fir is now to be found in the country.'"—298.

* * * * *

Judge Peters continues,

"My son Richard, who, with Mr. Adlum, accompanied me, in 1797 or 1798, on a tour into the wilderness in Lycoming county, to view some of my new lands, reminds me, that on these lands, invariably, the old decayed timber long blown down, or fallen with age, was of an entirely different species from that standing. We found flourishing ash, 6 feet diameter, sugar maple 6 feet through; and we measured one buttonwood, on some fine rich bottoms on the waters of the Loyalsock, thriving and healthy, 11 feet 8 inches diameter. These bottoms were covered with flourishing shell bark hickory, wild cherry, white walnut, and an immense variety of plums; though the whole country, in other parts, had no other timber than beach, sugar maple and hemlock; and some stately chestnuts on the ridges. My son also brings to my recollection, that when we surveyed the tract, called in old times the Pine Tract, in Northampton county, a great number of ash trees were intermixed with the present growth of oak and hickory."

* * * * *

A letter from Rembrandt Peale says,

"'In addition to this paragraph, I need only remark, that these morasses contain abundance of pine burs,* together with the trunks and branches of wood evidently pine (specimens of both are now in the Museum, case No. 4,) of which I do not remember to have seen a tree growing in the neighborhood, and that it is only from the circumstance being so universally known by the inhabitants that it is not often spoken of.'"—p. 300.

* * * * *

Dr. Charles Caldwell, formerly of North Carolina, writes as follows:

"In other parts of North Carolina, where the growth of timber consists almost entirely of oak and hickory, if this be removed, it will be succeeded in a few years by a general and plentiful crop of young pines. Nor is it necessary to the success of this experiment, that the place cleared should be in a piny neighborhood. The event will take place with equal certainty, though there be not a pine within many miles."

* * * * *

"Certain tracts of that state (New Jersey) are covered entirely with forests of pine. If these be cut down, and the land not put immediately under cultivation, they are succeeded in a few years by a plentiful growth of young oaks. I am told that in some parts of New Jersey, nurseries of young oaks produced in this way are to be found in the centre of extensive forests of pine. I will not vouch for the truth of this fact. All I can say respecting it is, that I received it from a very respectable source, and that it perfectly comports in principle with what I have myself seen.

"In the course of the last century, the white pine sprang up spontaneously in a place called Duxborough, in the state of Massachusetts, without having been previously a native of the neighborhood. Between twenty and thirty years ago, there was a man still living who had a perfect recollection of the first pine that ever made its appearance in the township; whereas, at

*"This not only proves the pre-existence of a growth of pine timber, on the lands now occupied by a species entirely different; but it goes much further, in support of the analogy between natural and artificial products. This 'abundance of pine burs,' which we know contain the seed, found on these lands, is an indisputable evidence of there having been seed in plenty to produce pine timber, if the land had not been pine-sick:—to use a country phrase, applied to lands which will no longer admit of a repetition of the same kind of crop. R. PETERS."

present, that plant constitutes one-eighth part of the timber of the place. Though I can give no personal testimony in support of this fact, I notwithstanding believe it to be true."—p. 305—6.

* * * * *

And Thomas F. Leaming writes thus to Judge Peters:

"For some years past I have been in the habit of visiting some estates which belong to our family, in the county of Cape May, New Jersey, and have remarked myself, and heard it as a common fact, that wherever the pine timber is cut off, oaks invariably and hickories very frequently will spring up, and this is also the case where the timber has been taken off by fire; the hunting grounds, which lay in the upper part of Cape May and lower part of Cumberland counties, are set on fire very frequently, in the spring, to burn the under brush to facilitate hunting in the autumn; and although the timber is altogether pine, yet no pine springs up after the burning; while oaks and hickories invariably do. On the Penn tract, lying a few miles below Bridgetown, in Cumberland county, there have been for several years straggling settlers, who have taken possession, and cleared some parts they have tilled; and other parts have been suffered to grow up. Nearly the whole of this tract was pine timber; and wherever it has been cut, oaks and hickories have grown up; and for several miles along the post road, which runs through it, I have seen black oaks stripped of the bark (for the purpose of tanning, &c.) where I have been credibly informed there was nothing but pine timber a few years since. If my statement of this well known fact will be of any service to you, you have my free assent to use it as suits your purpose, and in conclusion I will observe that I am convinced there is not a man of any observation in the counties of Cumberland, Gloucester and Cape May, but will confirm what I have mentioned."—p. 308—9.

ESSAY ON THE ARTIFICIAL GRASSES SUITED TO OUR CLIMATE AND SOIL. THE LEAST INJURIOUS MODE OF GRAZING. THE MODE OF PREPARING MEADOWS, PRESERVING THEM, AND MAKING HAY.

For the Farmers' Register.

1. A delusion has long prevailed, that our section of Virginia is not adapted to the growth of grass. Abundant and incontestable evidence can be adduced to prove, that wherever well-directed efforts have been made to promote its growth, they have met with success. The delusion has arisen from observing the effects of that scourging tillage which has been practised, it is believed, ever since our noble forests surrendered to the woodsman's axe. When our lands ceased to produce good crops of tobacco, vegetation was prevented or destroyed for the benefit of the corn crop, wheat followed corn, hogs and cattle were the gleaners of the wheat field, and every sprig of grass which came up during the remainder of that and the whole of the next year was greedily devoured by a hungry stock, which roamed in what was misnamed the pasture-field. How unreasonable to expect that grass could grow under such a system! And yet, because it did not, our lands were denounced, our farmers began to believe the oft-repeated slander—and many emigrated in quest of the grassy regions of the west. Happily for us who remain, it has been discovered that injustice has been committed—that under kind treatment and a sanative system, our lands may again smile in verdure—that the long-legged hog may be shoved aside by the chubby breeds which yield the nice round ham, and Durhams and Devons may chew the cud, reposing on beds of luxuriant clover. This is a picture which we may realize by careful attention to the growth of artificial grasses.*

2. Experience shows that red clover is well adapted to most of the arable lands of eastern Virginia. It grows best in a dry soil. Indeed, none of the artificial grasses will flourish in wet lands. Let one gallon of clover seed be sown to the acre, as early in the spring as may be deemed safe from freezing weather. If the land be harrowed when the seed is sown, it will probably be better protected from the late spring frosts. Farmers who have done this, think the wheat as well as clover is improved by this process; but it is generally inconvenient at this season to pursue it, and may be dispensed with.† The ground will then be found covered with cracks to admit the seeds, which the first rain will cover. When the land has been sown with clover for a series of years, half a gallon to the acre will be sufficient; but in sowing lots for cutting or grazing heavily, two gallons, and even 2½ gallons, are recommended by skilful farmers.

3. To insure the growth of clover, a liberal use of plaster is indispensable. In a rich soil, and with a favorable season, it *may* grow without the aid of plaster—but it is likely to assume a yellow, sickly hue, even if it survive the summer's sun. The best mode of sowing is to soak the seed one night in water, and mix with it double its quantity of plaster. On land where the soil had been worn bare, and completely impoverished by severe cropping and grazing, this method has produced a fine growth. I would recommend this practice to be always pursued.‡ It is follow-

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* Doctor Archer, whose farm is near Fortress Monroe, Old Point Comfort, gives strong testimony on this subject. In the 1st vol. of the Farmers' Register, p. 399, he says, "I do not hazard too much when I say, that timothy, herds-grass, orchard grass, tall meadow oat, feather grass, clover, and lucerne, all of which I have fairly tried, thrive as well and grow as luxuriantly as in most parts of our extensive country. For five years I have turned my attention very much to this branch of agriculture; two or three interprising gentlemen in this, and in Norfolk county, have done the same. The charm is now broken, all acknowledge that our hay is as good as ever was imported from the eastward; and in a few years, I hope to see our old fields transformed into profitable meadows."

† When stiff, *glazed* wheat land is sown, the use of the harrow is almost indispensable to loosen the soil for the reception of the seeds, else they bound into the water furrow, or lie exposed to sun and frost, and, being unable to insert their roots, perish after they have vegetated.

‡ The writer has a fine lot of clover, which was sown after rye on the 8th of September last. He

ed by other advantages besides the invaluable benefit of insuring a good growth. The seed is more easily sown and more equally distributed —it saves the labor of sowing plaster during the first spring, and relieves the wheat from the danger of being more liable to rust by the application of plaster sown broad-cast, a danger, however, which has never been observed by the writer, though it is deemed by some farmers to be incurred. Twelve months after the clover is thus sown, it should be plastered during moist or showery weather, with about one bushel to the acre. Towards the last of May, or early in June, the bloom begins to assume a brownish hue, and it is then fit for the scythe, if designed for hay or for feeding green to cattle—but if sown for the purpose of restoring fertility to an exhausted soil, or renewing its energy after a debilitating crop, the most judicious plan is to leave it unmolested until after harvest, when it is beginning to fall upon the land, and its stalks become hard. The grazing of cattle may then be permitted; though it is prudent to remove them in wet weather. Mr. Carter, of Shirley, thinks this mode of grazing beneficial.*

4. Timothy (*Phleum pratense*) grows well in good soils, in both low and elevated situations. Herds-grass (*Agrostis vulgaris*) is better adapted than any of the cultivated grasses to moist lands. It may be overflowed all winter, and is, consequently, a fitting grass for our ice ponds, which are kept dry during other seasons. Orchard grass is suited to land shaded by trees, and is sown by some farmers for making hay. It is fine for milch cows. In the spring, it furnishes good grazing before other grasses. Lucerne is a valuable grass, and bears more frequent cuttings than any other. It must be sown in drills 3 feet apart, and cultivated. The most economical mode of raising it, is to cultivate beets or some other cleasing crop between the rows of lucerne, and thus cultivate both at the same time.

5. The next subject of inquiry, the least injurious mode of grazing, has been in some measure anticipated in the foregoing remarks. The system least injurious to the land must be that which deprives it in the least degree of the vegetable matter necessary for its fertilization. After the second year's growth of clover has fully matured, a very small portion of its fertilizing qualities is abstracted by the grazing of cattle, which eat the tender shoots, but trample to the ground the principal growth; and the hoof seems beneficial in compacting the soil, which has become loosened by the vigorous roots of the clover. When corn is cultivated on clover land, it is necessary to graze it in order to prevent or mitigate the depredation of the grub worm, which otherwise abounds to the great deterioration of the crop. Where a plantation is cultivated in these fields, provision for stock should be secured in lots of clover, or of rye and clover, to be grazed successively until such times as would not be injurious to the clover fields. Where there are four fields, the stock are turned upon the third year's clover, which should furnish an abundant supply until after harvest, when they may feed as above stated, on the growth of the second year. A *standing*, or permanent pasture cannot be reprobated in terms too strong. It is alike ruinous to land and stock. The few who possess the advantage of firm marshes, have a ready resource when it would be injurious to turn stock upon their grass fields.

The advantages of meadows are very little appreciated by eastern Virginians. It is most discreditable, that we do not make hay sufficient to supply the wants of our own population. It is imported annually from the north, and even our farmers sometimes buy imported hay.* We can employ a portion of our land in no tillage more beneficial or profitable. It is capital bearing a very high annual interest. A good meadow will produce every year a crop more valuable than any of the cereal crops; and, moreover, these are liable to many vicissitudes in such land as is well adapted to timothy and herds-grass. There are very few farms which have not a few acres of this description of land.

It being the general opinion (an opinion, however, which may well be controverted) that meadows yield large crops of corn, they are frequently planted with this grain, the cultivation of which is cleansing, and thus well fitted to prepare the soil for the reception of grass seeds. Beds for hay should have the width of two corn rows—10 or 11 feet—the single row being inconvenient in mowing. To prepare a meadow, two rows of corn may be cultivated on this wide bed. But where the meadow has been, by no previous design, prepared for sowing grass seeds, and the corn crop has been cultivated in the usual way, the crop should be cut off early in September, (the corn, it will be soft, may be used for fattening hogs,) the beds ploughed double with a good rise in the centre to prevent water from settling thereon, harrowed, and reduced carefully to a fine tilth. Any degree of labor expended in executing this process thoroughly will be amply compensated. The seeds should be sown as soon as practicable.

The fitness of the soil for the sort of grass best adapted to it may be tested by a mixture of clover, timothy and herds-grass†—one third of each.

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sowed it in the way here recommended. This and other successful results, induce him to believe that clover thus sown will succeed well after corn, it being sown as late in the summer as practicable. Wheat might then precede corn, instead of being followed by it, and both crops would be materially improved.

* Farmers' Register, vol. i. p. 134.

* There are a few honorable exceptions. The small counties of Elizabeth City and Essex are reported, in the late census, to have produced respectively, 1235 and 1466 tons of hay, Isle of Wight 20,000, (?) Nansemond 1989, Norfolk county 2500, Princess Anne 76,250, (?) Surry 1209, Stafford 2083.

† Dr. Archer condemns this mixture, because "the clover was ready for the scythe in May, the other two were not ripe for three or four weeks afterwards." He consequently lost the best part of his clover crop. His loss would have been diminished greatly, if not wholly avoided, by cutting his grass about a week later. The heaviest part of the first, and perhaps second crops, would consist in clover, and then the others will supersede it, and that best adapted to the soil will acquire the superiority. If any deem it presumptuous to differ from so experienced a farmer, let him follow the doctor's advice, and mix either timothy and herd's grass, or meadow oat and clover, which mature at the same time.

Two gallons to the acre will probably produce a good growth, but the sower had better sow double this quantity rather than fall below it. Thick sowing of meadows, in which weeds are commonly so prolific, is the best economy; and, besides stopping the growth of weeds, would insure a larger crop for the first cutting in the ensuing summer. Meadows are sometimes sown in the spring, but this season is not so favorable as the autumn, for a dry summer will be unfavorable to the young grass, the land is then more likely to produce weeds, farmers are commonly more busy, and the crop will not be fit for the scythe in less than 16 months. The meadow must be drained completely; no water should be permitted to remain on any part of it, and from time to time all bushes and noxious weeds should be extirpated. The bullrush is the worst pest. It is the offspring of superabundant moisture. It must be cut up by the roots, or it will soon acquire complete possession, the herds-grass, and all other grasses being unable to resist its vigorous encroachments. Besides extirpating the weeds, the meadow is best preserved by an occasional sprinkling, before the spring growth commences, of well-rotted stable manure. The Farmers' Register for May, page 200, tells us of a farmer in Massachusetts, who has four acres of *mowing ground*, which produces annually fully sixteen tons of hay. He uses plaster of Paris freely. We are not informed whether it is meadow or high land. Some recommend the use of plaster in what we usually term meadows, but the writer has no experience in this mode of application. Scarification of old meadows is recommended; but it must be a difficult process. I once made an unsuccessful attempt with a heavy iron-tooth harrow, which made scarcely an impression, the closely matted grass roots resisting an entrance. The process was attempted in order to level the single beds, on which the seeds had been sown erroneously, from want of experience and good counsel.

Hay-makers concur in recommending meadows to be mowed before the seeds are fully ripe. This period, in our latitude and elevation of country, is from the middle to the latter part of July. The modes of curing the hay are various. It is the most simple, economical, and an equally efficacious plan, to expose the grass to the sun so long as merely to dry it—to rake it into wind-rows in the latter part of the day on which it is cut—the following day, to put it into small cocks for curing, in two or three days to make other cocks by reducing two into one, forming it on intermediate ground, so as to remove and turn over each one. And as early afterwards as is convenient, to haul it to be stacked or ricked. In good weather, the hay is, by this method, cured with good fresh color and sweet flavor, and is pliant and yielding, not crisp and hard, as when it is too much cured by long exposure to the sun. If interrupted by rains or showery weather, more labor is required in drying the grass so as to prevent mildew. If it is put up wet, it will heat quickly even in small cocks; hence, constant vigilance is necessary in securing it from excessive dampness, and it must be completely dry when taken to be stacked. It is a safe precaution to throw open in the morning as many cocks as shall be hauled to the stack during the day.

Meadows of good quality, well drained, well preserved, and manured occasionally, will produce annually from one and a half to two tons of hay per acre. One ton and a half are worth not less than $22.50, sometimes $30, equal to the value of from seven to ten barrels of corn every year—a product which few, if any, meadows will average for a series of years.

Lastly, the second growth of the meadow, termed the aftermath, furnishes excellent grazing for beeves in the fall of the year. When winter, dreary winter, follows in its turn, the cow, the ox, the horse, will render a daily tribute of thanks and service to a provident master, for the liberal provision yielded by his meadow; and the master, when the well-fatted, finely-marbled round adorns his board, will renew his acknowledgments for the bounties of a gracious GOD, who provides so plentifully for the wants of man.

E. T. T.

King George, July, 1842.

MARLING IN SOUTH CAROLINA.

To the Editor of the Farmers' Register.

* * * I am still pressing on with the marl, and have collected on my bluff, since I planted my crop, some 25,000 bushels, and am still bringing up 2400 bushels per week; I shall begin to haul it out as soon as I gather fodder. The forwardness of cotton will interfere with me some, as I shall have little or no time between gathering fodder and commencing to pick, but I am resolved to have between 600 and 700 acres marled for the next crop. The land marled this year shows the effects very plainly, and that marled earliest shows best, which gives me faith in its continuing to improve. I think, as thinks every one, that the effect *this year* is fully equal to a fair coat of our stable manure. Both the corn and cotton marled are also in advance of earlier plantings, apparently a week or 10 days now. I find that some bald places have been injured, but, to counterbalance, low wet places which I thought too wet for marl, have proved to have been only too sour heretofore, and are bearing finely. My experimental acres in corn will afford a pretty fair test, but not in cotton. It turns out that the acres without marl and with the 300 bushels of marl were far superior in point of soil to those with the 100 and 200 bushels. I was deceived by the stalks of cotton. The last year being a very peculiar one, the poorer acres produced as well as the best. In addition to this, the marled land being slower to come up, my overseer planted it all over again. The acre unmarled vegetated earliest, and was only replanted; half of it is 10 days or more older than the others. On the whole, however, I am fully satisfied, and if it goes on as it now promises, I shall go on until I marl all my planting land. My people all say the marl has very much improved the land for working. The stiff parts are mellowed, and the light made more consistent. They say, too, that they can work the nut-grass better, and kill more of it. This terrible nuisance made its appearance a few years ago on my place. I have done nothing to arrest it, for I

have never known any thing to avail. Do you suppose marl can have any effect on it? Possibly it is an acid grass, and, like sorrel, may be rooted out by alkalies. * * * * *

[We have heretofore, on several occasions, remarked upon the absence of all effort to improve by marling in South Carolina; and afterwards welcomed the news of the earliest movements towards that great and beneficial work. We rejoice now to learn that, at least on one large plantation, marling is in that state of progress, and has been already so successful in profitable effects, as to leave no doubt of there being now fairly commenced such operations as will soon make South Carolina a marling country. In this great "internal improvement" of that state, (more valuable for private profit, and for augmenting the public wealth, than all her great and costly improvements for transportation, on rail-roads and by navigation,) the writer of the private letter from which we have taken the liberty of extracting for publication the foregoing passage will be one of those pioneers who will render the greatest service to his countrymen, by practically showing to them the way to improve and reap rich profits from their great and almost totally neglected natural resources. In consideration of our object, to make his example more profitable te others, we trust that he will excuse this use made of a portion of the last received of his several private letters, written to obtain information for his own guidance in marling. We cannot presume farther, and point out the writer or his locality more distinctly. But we may say to those of his countrymen who can use marl, and have not done so—"Seek out for the most extensive and successful marling operations now in progress in South Carolina—see them and judge for yourself, and then act according to your judgment of the proofs of success and profit." It is true, and lamentable, that all that is said, written, or published to urge to this or any other novel improvement in agriculture, has scarcely any effect, even on those who hear and read all the facts and reasoning. But exhibit the same truths to the eyes of the same persons, and twenty of them will follow the example, where one would without such ocular proofs being presented. *We* have, in our way, by writing and publishing, done very far more than our correspondent to instruct his countrymen, as he has been instructed, and almost to no purpose; but his practice will do what our precepts have failed to effect in every particular, except on himself and perhaps a few others. May he effectually do this good work, in which we have, for his state, and so far, signally failed.—Ed. F. R.

VALUE OF IMPORTS AND EXPORTS, &c., FROM 1821 TO 1841.

From the Philadelphia Public Ledger.

The annexed tables, showing the value of imports and exports annually, from 1821 to 1841 inclusive—the receipts into the treasury, annually, from customs, during the same period—and the value of bullion and specie imported and exported—was communicated to Congress on the 17th ultimo, having been prepared by the Register of the Treasury, in compliance with a resolution of the House of Representatives.

	VALUE OF IMPORTS.		
Year.	Free of duty.	Paying duty.	Total.
1821	$10,082,313	$52,503,411	$62,585,724
1822	7,298,708	75,942,833	83,241,541
1823	9,048,288	68,530,979	77,579,267
1824	12,563,773	67,985,234	80,549,207
1825	10,947,510	85,392,565	96,340,075
1826	12,567,769	72,406,708	84,974,477
1827	11,855,104	67,628,964	79,484,068
1828	12,379,176	76,130,648	88,509,824
1829	11,805,501	62,687,026	74,492,527
1830	12,746,245	58,130,675	70,876,920
1831	13,456,625	89,734,499	103,191,124
1832	14,247,453	86,779,813	101,029,266
1833	32,147,950	75,670,361	108,118,311
1834	68,393,180	58,128,152	126,521,332
1835	77,940,493	71,955,249	149,895,742
1836	92,056,481	97,923,554	189,980,035
1837	69,250,031	71,739,186	140,989,217
1838	60,860,005	52,857,399	113,717,404
1839	76,401,792	85,690,340	162,092,132
1840	57,196,204	49,945,315	107,141,519
1841	66,019,731	61,925,757	127,945,488

	VALUE OF EXPORTS.		
Year.	Foreign Merchandise.	Domestic Produce, &c.	Total.
1821	$21,302 488	$43,671,894	$64,974,382
1822	22,286,202	49,878,079	72,160,281
1823	27,543,622	47,155,408	74,699,030
1824	25,337,157	53,649,500	75,986,657
1825	32,590,643	66,944,745	99,535 388
1826	24,539,612	53,055,710	77,595,322
1827	23,403,136	58,921,691	82,324,827
1828	21,595,017	50,669,669	72,264,686
1829	16,658,478	55,700,193	72,358,671
1830	14,387,479	59,462,029	73,849 508
1831	20,033,526	61,277,057	81,310,583
1832	24,039,473	63,137,470	87,176,943
1833	19,822,735	70,317,698	90,140,433
1834	23,312,811	81,024,162	104,336 973
1835	20,504,495	101,189,082	121,693,577
1836	21,746,360	106,916,680	128,663,040
1837	21,854,962	95,564,414	117,419,376
1838	12,452,795	96,033,821	108,486,616
1839	17,494,525	103,533,891	121,028,416
1840	18,190,312	113,895,634	131,571,956
1841	15,469,081	106,382,722	121,851,803

	RECEIPTS INTO THE TREASURY.	BULLION AND SPECIE.	
Year.		Imported.	Exported.
1821	$13,004,447	$8,064 890	$10,478,659
1822	17,589,762	3,369,846	10,810,180
1823	19,088,433	5,097,896	6,372,987
1824	17,878,326	8,379,835	7,014,552
1825	20,098,713	6,150,765	8,470,534
1826	23,341,332	6,880,956	4,704,236
1827	19,712,283	8,151,130	8,014,880
1828	23,205,524	7,489,741	8,243,476
1829	22,681,966	7,403,612	4,924,020
1830	21,922,391	8,155,964	2,178,773
1831	21,224,442	7,305,945	9,014,931
1832	28,465,237	5,907,504	5,656,340
1833	29,032,509	7,070,368	2,611,701
1834	16,214,957	17,911,632	2,076,758
1835	19,391,311	13,131,447	6,477,775
1836	23,409,941	13,400,881	4,324,336
1837	11,169,290	10,516,414	5,976,249
1838	16,158,800	17,747,116	3,508,046
1839	23,137,925	5,595,176	8,776,743
1840	13,499,502	8,882,813	8,417,014
1841	14,487,216	4,975,883	10,034,332

Estimate.—It has been estimated by some that there was of specie and bullion in the country on the 30th September, 1820, - - $18,000,000
But say - - - - 20,000,000
Imported from 1821 to 1841, - 181,589,841

201,589,841
Deduct exported from 1821 to 1841, 138,085,922

Balance, - - - - - 63,503,919

SEASON AND CROPS.

The clear weather mentioned in our notice of last month continued but three days, (which however was the salvation of the greater part of the wheat crops,) after which rains recommenced and continued every day, for the greater part of July. This remarkable continuance of rains, increased the previous damage of the wheat crop, and lasted through the oat harvest, to the great injury of that crop. The corn crops have suffered every where from the ground continuing too wet to be worked, and especially on all level lands, where much of the growth has been water-soaked until destroyed.

The continued and heavy rains have caused the rivers to flood their low lands. Great damage has thus been caused to the growing crops of corn and tobacco, and still more to the wheat in shocks. James river, at Richmond and above to Lynchburg, was higher than has occurred since 1795, and the damage to crops on all those extensive and rich low grounds has been enormous.

The weather and earth now dry, and rain is wanting.

July 29.

With this number will commence the publication of a new and enlarged edition of the 'Essay on Calcareous Manures,' of which a portion will be issued with each succeeding number of the Farmers' Register. The pages of the Essay will be numbered separately, so as to be bound up together, either at the close of this volume, and as a part of it, or separately, if preferred. Either eight or sixteen pages, (on an average,) in addition to the usual sixty-four, will be given with each number while the publication of the Essay shall form a part. The twelve pages of title, table of contents, and introductory matter, which will stand first when the publication is completed, are as yet omitted, and will be supplied hereafter, when printed.

ERRATA.

In report on Brandon farms,

Page 281, column 1, lines 42 and 43, for "lbs. of butter," read *dollars' worth* of butter.

At page 277, erase the repetition of the sub-head, "*Preparation for and cultivation of corn.*"

In the editorial article, "Farming at Westover," in No. 4, at near end of page 171, there is an *incidental* reference to the crop of wheat of 1841, as amounting to 5000 bushels. This was an error, which Mr. Selden has since enabled the editor to correct. The crop referred to was not quite 4200 bushels. The mistake was not founded on any statement made by Mr. Selden, nor on any thing said on that occasion, but was caused by the editor's reliance on previously heard and common report, which he supposed undoubtedly correct.

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